# NAYLOR ROAD

## Metro Station Area Access and Capacity Study

December 2012

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Washington Metropolitan Area Transit Authority
Department of Planning and Joint Development
Office of Station Area Planning and Asset Management

December 2012


**Lead Agency**
Washington Metropolitan Area Transit Authority
Office of Real Estate and Station Planning
600 5th Street NW
Washington, DC 20001

Stan Wall, Director of Real Estate and Station Planning
Robin McElhenny, Manager of Station Planning
Catherine Jones, Project Manager

**Consultant**
Parsons Brinckerhoff
1401 K Street NW, Suite 701
Washington, DC 20005

Brian Laverty, AICP, Project Manager
Crystal Saunders
Nick Schmidt

MM
Naylor Road Station
Naylor Road Station
H11 H12 H13

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To Trains
HOLD HAND RAIL
1

STOP
C12 C14
H11 H12 H13

# Executive Summary

## Project Purpose

The Washington Metropolitan Area Transit Authority (Metro) initiated the *Naylor Road Metro Station Area Access and Capacity Study* to evaluate existing and future station access and capacity needs within 1/4-mile of Naylor Road Station, particularly with respect to transit-oriented joint development (TOD) within the station area.

This report presents an evaluation of existing conditions and future station access and capacity needs of all modes at the Naylor Road Station and the adjacent area. In support of the planned transition of the Naylor Road Station area into a regional TOD center, this study determined the future (2040) needs for access facilities by mode and identified improvements to meet those needs. Finally, this report includes a review of relevant prior studies that have identified issues in the Naylor Road area. The findings of these previous studies are incorporated into this planning effort.

## Context

Over the past decade, Prince George's County, the Maryland-National Capital Park and Planning Commission (M-NCPPC), and the State of Maryland have recognized Naylor Road Station as a catalyst for development in the Branch Avenue corridor.

Recognition began in the 2002 *Prince George's County Approved General Plan* (General Plan), which designated the Naylor Road Station as a Community Center within the County's Developed Tier to encourage mixed-use development. The General Plan vision for Prince George's County's Developed Tier is a network of sustainable mixed-use medium-to high density communities that support transit and are oriented toward pedestrians.

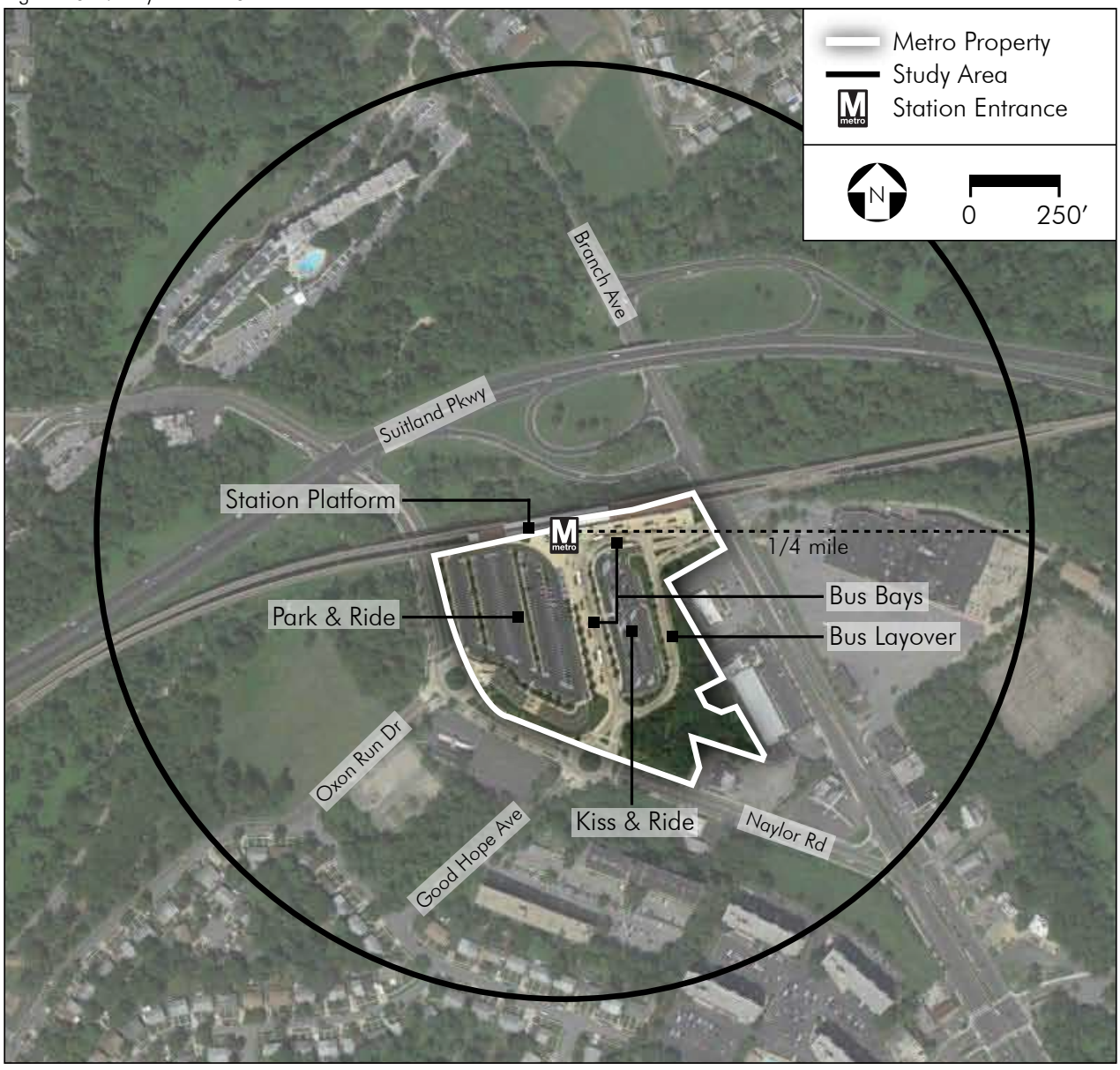
M-NCPPC's 2008 *Approved Preliminary Branch Avenue Corridor Sector Plan and Proposed Sectional Map Amendment* (Branch Avenue Corridor Sector Plan) established policies and zoning to encourage mixed-use TOD within a half-mile radius of the Metrorail station, and designated Naylor Road Station a Regional Center—a location with high transit access for regionally marketed destinations.

In 2010, the State of Maryland formally designated the Naylor Road Station a TOD site, increasing the State's ability to use resources to develop and construct TOD-supportive transportation projects at the station.

## Existing Station Area Characteristics

The elevated station platform, south of and parallel to Suitland Parkway, is arranged in a center configuration with one access point connecting to a single mezzanine at ground level. All station area facilities are contained within three Metro-owned parcels totaling 7.6 acres. Station area facilities lie south of the platform and tracks and are bounded by Naylor Road (MD 637) to the west and south and Branch Avenue (MD 5) to the east. Naylor Road Station's eight bus bays, which wrap around its Kiss & Ride lot, serve 11 Metrobus and TheBus routes. Vehicle access is

Figure ES-1: Naylor Road Station Facilities




*Source: Google Earth (aerial)*

shared between these two facilities with entry/exit points at both Naylor Road and Branch Avenue. The Kiss & Ride lot contains 73 parking spaces, and the 368-space Park & Ride surface lot and its entrance roadway comprise the western half of the station area. Cyclists are accommodated through 10 bicycle racks and four bicycle lockers.

Table ES-1: Access and Egress at Naylor Road Station

| | 2007 Mode Shares* | | 2007 Mode Shares Applied to 2012 Passenger Totals | |
|---|---|---|---|---|
| Mode | Access | Egress | Access | Egress |
| Walk | 24% | 12% | 760 | 377 |
| Bicycle | 0% | 0% | 0 | 0 |
| Bus | 37% | 54% | 1,170 | 1,695 |
| Kiss & Ride | 16% | 7% | 505 | 220 |
| Park & Ride (drivers and passengers) | 22% | 23% | 695 | 721 |
| Other (taxi, incomplete surveys) | 1% | 4% | 30 | 125 |
| Total | 100% | 100% | 3,160 | 3,138 |

*Source: 2007 Metrorail Passenger Survey, Metro faregate data*

** This mode share included satellite parking at the Legend Nightclub across Naylor Road*

Naylor Road Station averaged 3,160 entries and 3,138 exits per weekday during May 2012, a seven percent decline from the station's highest recorded ridership in 2006. Morning and afternoon peaking is very pronounced, with most people entering the station in the morning and exiting in the afternoon—Naylor Road Station is heavily used by commuters traveling into the District. During the general Metrorail systemwide morning peak period (5:00 to 9:30 AM), approximately eight passengers enter the station per every exiting passenger. Conversely, almost four passengers exit the station per every entering passenger during the afternoon systemwide peak period (3:00 to 7:00 PM).

Safe and efficient pedestrian access to Naylor Road Station is vital, as almost one in four Metrorail passengers access the station by foot. While the surrounding station area is fairly well connected by sidewalks of varying width and quality, many pedestrian facilities—sidewalks, crosswalks, signals, signage, etc.—in the station area need improvement and could potentially impact pedestrian safety. Nearby roadways, particularly Branch Avenue, serving as major pedestrian links are perceived as dangerous and uninviting for pedestrians, especially when crossing the street. Speeding motorists, missing or narrow sidewalks, missing crosswalks, curb cuts, long signal cycles, sidewalk obstructions, and unpaved pathways were observed along key pedestrian routes.

Current demand for bicycle parking at Naylor Road Station is low. Very few passengers bike to Naylor Road Station as a result of limited cycling facilities in the area as well as the station's location amidst regional commuter roadways with heavy traffic. As with pedestrians, Branch Avenue is perceived as a dangerous place for cyclists as well. No bike lanes, multi-use trails, or designated shared-use roadways are available to Naylor Road Station. However, residential roadways south of the station provide a safe alternative due to low traffic volumes and direct access via Good Hope Avenue. Ten bicycle racks and four bicycle lockers are located near the station entrance. All racks are located west of the station entrance while the lockers are found south of the entrance.

Naylor Road Station is served by Metrobus and Prince George's County's TheBus. Eleven routes directly serve seven saw-tooth bus bays; an additional unassigned serves as a passenger drop-off location for all routes. With the exception of the two bays closest to Branch Avenue, all bays are located within a counterclockwise bus loop that permits recirculation. Buses access the bus loop from Branch Avenue or Naylor Road, depending on the route. Bus drivers often experience delay when exiting via the Naylor Road roundabout as a result of heavy through

traffic. Bus bays are currently underutilized, with four of the seven revenue bays less than 50 percent occupied during the daily peak hour. However, station observations revealed that the unassigned drop-off bay is frequently occupied, which may block other bus drivers from advancing to their assigned bay. No private shuttles currently provide service to the station.

Station observations showed many of the Kiss & Ride lot's temporary parking spaces are unused during the afternoon peak period—the busiest time of the day for Metrorail Kiss & Ride facilities. Many drivers prefer to wait near the curb for passengers, sometimes creating traffic bottlenecks. This is a Metrorail systemwide trend. The Kiss & Ride lot is approximately two times larger than required by existing demand. However, Naylor Road Station's Park & Ride is small compared to other southern Green Line stations—368 daily spaces—and routinely reaches capacity before 8:00 AM. Off-site parking near the station remains limited.

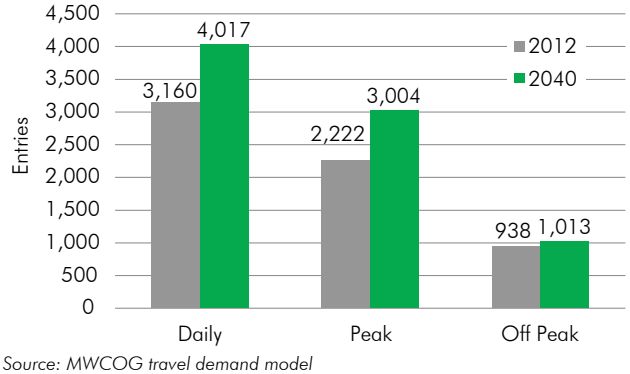
Branch Avenue, Naylor Road, and Suitland Parkway–roadways surrounding Naylor Road Station—are heavily traveled and primarily provide access for regional travelers. Crash records reveal that Branch Avenue's crash rate was more than twice as high as nearby Naylor Road in 2008, the most recent year available for comparison. Though SHA ranks Prince George's County first in Maryland in 2008 traffic fatalities, no roadway fatalities occurred between 2006 and 2008 near Naylor Road Station.

## Future Station Area Characteristics

The Naylor Road Station area is on the verge of revitalization and redevelopment that will define a sense of place. This vision is for complete redevelopment of the Naylor Road Station area, as well as a significant portion of properties along Naylor Road and Branch Avenue, by transforming the area from an automobile-oriented zone to a high-density, pedestrian-friendly district. This vision is supported by updated design guidelines that address building setbacks, the streetscape, building height, lighting, and other considerations.

Joint development at Naylor Road Station may require the assembly of additional properties in the area between Naylor Road and Branch Avenue. Approximately, 10.7 acres are available for development, which includes the station area. To achieve the TOD community and regional center envisioned, parking should be carefully managed at the redeveloped site; the number of parking spaces should be limited and shared parking between different land uses encouraged.

Figure ES-2: Estimated Growth in Passenger Entries at Naylor Road Station




*Source: MWCOG travel demand model*

The study team used the MWCOG travel demand model, updated for the Purple Line project to meet Federal Transit Administration (FTA) requirements, to estimate Metrorail ridership and mode share at Naylor Road Station in 2040. The model estimates a 35-percent increase in peak period Metrorail entries and an eight-percent increase in off-peak entries between 2012 and 2040, resulting in a total daily increase of 27 percent (Figure ES-2). Most of the growth in Naylor Road Station entries is concentrated in the peak period.

With the transformation of the Naylor Road Station area from an automobile-oriented transit center to a regional center of mixed-use TOD, how people access the station will change by 2040 (Table ES-2). The model estimates that walk and bike access will grow significantly, owing to the expected concentration of mixed-use buildings at the station in the future. While the model estimates a decline in automobile access as a percent of daily mode share, Park & Ride usage will remain high. This study assumed that bus ridership will grow similarly to Naylor Road Station's total entries (35 percent during peak periods and eight percent during off-peak periods) to ensure that adequate bus capacity is considered in future redevelopment. Finally, this study assumes that planning for up to three shuttle trips per hour during peak periods in 2040 is a reasonable, conservative assumption given the available data.

Table ES-2: 2040 Estimated Weekday Mode Share for Naylor Road Station

| Period | Park & Ride | Kiss & Ride | Bus | Walk/ Bike | Total |
|---|---|---|---|---|---|
| Weekday Mode Share Change from 2012 to 2040* | | | | | |
| Peak Periods | -3% | -49% | 35% | 39% | 35% |
| Off-Peak Periods | 167% | -75% | 8% | 294% | 8% |
| All day | 12% | -56% | 30% | 92% | 27% |
| Weekday Mode Share | | | | | |
| 2012 | 23% | 12% | 46% | 19% | 100% |
| 2040 | 20% | 4% | 47% | 29% | 100% |

** Rounded to the nearest whole number*

## Future Station Access Needs

Realizing Naylor Road Station's TOD vision will take years, and this redevelopment process is just now beginning through completed or in-process planning studies tasked with improving the station area and its multimodal access. This report uses information and findings from these studies as well as additional station observations and analyses performed specifically for this study to define station access deficiencies and opportunities for improvement—or more simply, station access "needs."

In addition, the study evaluated station capacity based on 2012 and estimated 2040 ridership levels. Table ES-3 shows that existing platform-to-mezzanine elevator capacity does not meet established standards, but that all other circulation elements at the existing mezzanine meet the minimum requirements for 2012 and estimated 2040 passenger loads.

This study also analyzed Naylor Road Station's emergency egress capacity under existing conditions as well as estimated conditions in 2040 (Table ES-4). This analysis is based on the requirements set by the NFPA 130 standards. Evacuation time analysis is based on a worst-case-scenario with peak-direction trains containing twice the typical number of passengers to simulate a missed headway. Metro uses these guidelines as design goals when modifying station facilities to increase their emergency safety capabilities. The analysis results show that Naylor Road Station presently does not meet emergency egress requirements for the afternoon peak period. However, as a result of shorter headways by 2040, the station is expected to meet all emergency egress standards in the future.

Table ES-3: Station Capacity Analysis Results

| Circulation Element | Existing | Elements Required | |
|---|---|---|---|
| | | 2012 | 2040 |
| Platform Escalators | 2 | 2 | 2 |
| Platform Elevators* | 1 | 2 | 2 |
| Faregate Aisles | 4 | 2 | 2 |
| Farecard Vendors | 7 | 1 | 1 |

** While only one platform elevator per mezzanine is required for ADA compliance, current practice by Metro is to provide two platform elevators per mezzanine.*

Table ES-4: Future Emergency Egress

| Measure (minutes) | NFPA Standard | 2012 | 2040 |
|---|---|---|---|
| Morning Peak | | | |
| Time to clear platform | 4.0 | 3.6 | 2.5 |
| Time to point of safety | 6.0 | 5.1 | 4.0 |
| Afternoon Peak | | | |
| Time to clear platform | 4.0 | 5.2 | 3.4 |
| Time to point of safety | 6.0 | 6.7 | 4.9 |

## Station Recommendations

Station access recommendations were developed in response to station needs and are divided into two general categories:

- Recommendations based on deficiencies observed in the existing station area configuration that can be addressed either as part of or before TOD implementation, and
- TOD-based recommendations, or those recommendations tied to and made necessary by the expected redevelopment of the station area.

### Existing Station Area Recommendations

Existing station area recommendations, shown in Table ES-5, were devised in response to observed deficiencies that result from the present configuration of Naylor Road Station's facilities and the existing conditions of its surroundings. Existing station area recommendations can be implemented independently of each other, but some recommendations may be more effective if implemented in concert.

Table ES-5: Summary of Existing Station Area Recommendations

| Location | Recommendation |
|---|---|
| Naylor Rd | Add pedestrian signals, crosswalks, and pedestrian refuge areas at Suitland Pkwy intersection |
| | Add sidewalks on east side between Suitland Pkwy and Oxon Run Dr, and on both sides north of Suitland Pkwy |
| | Add shared lane markings and "Bikes May Use Full Lane" signs north of Suitland Pkwy* |
| | Add proposed bicycle lanes and shared lane markings south of Suitland Pkwy |
| | Add proposed sidewalks and remove fence along observed pedestrian desire lines |
| | Install rapid flash beacons at roundabout crosswalks and crosswalk at the right-turn lane to Branch Ave |
| | Study additional marked crossing between Good Hope Ave and Branch Ave* |
| Branch Ave | Add sidewalk on east side between station entrance and Southern Ave |
| | Add proposed bicycle lanes from the District line south |
| | Add proposed pedestrian signals and crosswalks at all approaches at station entrance intersection |
| | Add pedestrian refuge areas and reduce northbound right-turn radius at station entrance intersection |
| | Add proposed new and widened sidewalks south of station entrance intersection |
| | Study midblock pedestrian hybrid signal south of station entrance intersection* |
| Oxon Run Dr | Add new and widen existing sidewalks |
| | Add shared lane markings and "Bikes May Use Full Lane" signs* |
| | Add connection to proposed Oxon Run Trail |
| | Add curb extension, crosswalks, and reduce curb radii at Oxon Park St intersection |
| Good Hope Ave | Add sidewalks on west side |
| Suitland Pkwy | Implement proposed Suitland Parkway multi-use path into Maryland |
| Oxon Run Park | Implement proposed Oxon Run Trail |
| Station Footprint: Bike & Pedestrian | Add pathway from Oxon Run Dr through Park & Ride lot to station entrance |
| | Add at least 10 bicycle parking spaces |
| Bus Bays | Require bus drivers to leave Bay C after discharging passengers |
| | Require operators of large shuttles to apply for a station access permit** |
| Kiss & Ride | Improve motorist awareness of Kiss & Ride entrance at Branch Avenue |
| | Add striping and signage to encourage motorists to queue near Kiss & Ride shelters |
| | Designate space for small shuttles |
| General | Implement improved wayfinding signage |
| | Add bus stop amenities—benches, shelters, sidewalk connections, and ADA accessibility features—where missing |

** More detailed study and analysis is required to determine overall feasibility*

*** Requires adherence to Metro's shuttle bus policy, two key factors are sufficient bus bay capacity and compliance with insurance requirements.*

## TOD-Based Recommendations

In order for the established TOD vision at Naylor Road Station to be realized, the current station area footprint—comprised of separate bus, Kiss & Ride, and Park & Ride facilities—must be reconfigured to create more developable land. Demand for Park & Ride and bus facilities, however, is estimated to increase in the future. Balancing the vision for a redeveloped station and the need to meet growing access demand will require a variety of **strategies**—individual recommendations tied to and made necessary by transit-oriented redevelopment—and **options**—groups of strategies designed to accommodate the access needs of Naylor Road Station to 2040.

The options presented in Table ES-6 have been grouped into those that achieve access goals by A) shifting parking from the station to other locations, B) replacing the station's parking facilities on-site, or C) expanding the parking facilities of the southern Green Line. Kiss & Ride access would remain at the station under all options.

Options are centered on parking because it is a central driver of transit system accessibility, and because its availability is among the most important aspects of successful TOD. While demand for parking is high at Naylor Road Station and will continue to grow in the future, devoting too much space for parking can negatively impact the pedestrian- and transit-friendly environment of TOD as well as reduce the amount of developable land. A balance must be struck to meet station access needs without compromising TOD placemaking principles. Presenting a variety of options provides different means of achieving this desired balance in the future.

Table ES-6: Summary of Options

| | Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Shift Parking | | | Replace Parking | | | Expand Parking | | |
| | Options | | | | | | | | |
| Strategies | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 |
| All-in-one access facility (bicycle, bus, Kiss & Ride, and/or Park & Ride within the same garage) | | | | ● | ● | ● | ● | ● | ● |
| Developer-constructed garage with reserved transit parking in a mixed-use building | | | | | ● | | | | |
| Developer-constructed parking garage with shared transit parking in a mixed-use building | | | | | | ● | | | |
| Publicly-owned satellite parking facility with feeder transit service to Green Line stations | | ● | | | | | | ● | |
| Satellite parking through shared-use agreements with feeder transit service to Green Line stations | | | ● | | | | | | ● |
| Additional parking to other Green Line stations | ● | | | | | | ● | | |
| Real-time parking information | | | | ● | ● | ● | ● | ● | ● |
| Preferred carpool parking and/or discounts | | | | ● | ● | ● | ● | ● | ● |
| Enhanced bus connectivity | ● | ● | ● | ● | ● | ● | ● | ● | ● |

Construction of new, permanent station area access facilities will be located on land currently occupied by existing facilities. As a result, the Naylor Road Station area will likely require temporary relocation of these facilities to maintain access during implementation of the station area site plan. The potential locations of both permanent and temporary access facilities are governed by Metro's *Station Site and Access Planning Manual*, which sets guidelines for maximum allowable walking distances between station facilities and entrance (500 feet for connecting transit stops, 600 feet for Kiss & Ride facilities, and 1,500 feet for Park & Ride facilities) in accordance to Metro's station access hierarchy. Maximum allowable walking distances and other constraints in the area limit temporary access facilities to four general locations (Figure ES-3).

Table ES-7 highlights where Metro could potentially construct facilities. The most common constraints for Locations 2, 3, and 4 include costs to purchase additional land, impacts to existing businesses, and forcing customers to cross busy roadways. Location 1 is closer to the station entrance and Metro already owns much of this land. However, Location 1 will be the focal point for joint development and the actual availability of land may be constrained once a final site plan is defined. Note that each location is large and would allow for many different facility configurations. Narrowing down the specific facility setting within any of the four general locations is reserved for more detailed planning and design at a later date.

Figure ES-3: Potential Station Access Facility Locations

*Source: Google Earth (aerial)*

Table ES-7: Opportunities and Constraints of Potential Station-Access Facility Locations

| Figure ES-3 Map ID | Based on Maximum Allowable Walking Distance to Station Entrance | | | Opportunities | Constraints |
|---|---|---|---|---|---|
| | Bus Bays | Kiss & Ride | Park & Ride | | |
| 1A | ● | ● | ● | – Proximity to station entrance<br>– Metro owns most of the land | – Impacts existing station access facilities<br>– Impacts existing business<br>– Land purchase may be required |
| 1B | | ● | ● | – Proximity to station entrance<br>– Metro owns most of the land | – Impacts existing station access facilities<br>– Impacts existing business<br>– Land purchase may be required |
| 1C | | | ● | – Does not impact operations of existing access facilities | – Impacts existing businesses<br>– Land purchase required |
| 2 | | | ● | – Does not impact operations of existing access facilities<br>– Vehicular traffic reduced at Naylor Road roundabouts | – Customers must cross Branch Avenue<br>– Impacts existing businesses<br>– Land purchase required<br>– Most likely redeveloped first |
| 3 | | | ● | – Does not impact operations of existing access facilities | – Customers must cross Naylor Road<br>– Impacts existing business<br>– Land purchase required<br>– Relatively narrow with steep topography<br>– Adjacent to existing residential area<br>– Non-standard size parking garage<br>– Constrained vehicular access |
| 4 | | | ● | – Does not impact operations of existing access facilities<br>– Customers have a history of parking at this location | – Customers must cross Naylor Road<br>– Impacts existing business<br>– Land purchase required<br>– Adjacent to existing residential area |

# Introduction

## Project Purpose and Scope

The Washington Metropolitan Area Transit Authority (Metro) initiated the *Naylor Road Metro Station Area Access and Capacity Study* to evaluate existing and future station access and capacity needs within 1/4-mile of Naylor Road Station, particularly with respect to transit-oriented joint development (TOD) within the station area.

This report presents an evaluation of existing conditions and future station access and capacity needs of all modes at the Naylor Road Station and the adjacent area. In support of the station area's planned transition into a regional TOD center, this study identified site access enhancements needed to improve pedestrian and bicycle connections and vehicular flow in the station area; determined future bus facility needs at the station; and determined future parking demand and options for replacing Metro parking due to proposed redevelopment at the site. Finally, this report includes a review of relevant prior studies that have identified issues in the Naylor Road area. The findings of these previous studies are incorporated into this planning effort.

## Context

Over the past decade, Prince George's County, the Maryland-National Capital Park and Planning Commission (M-NCPPC), and the State of Maryland have recognized Naylor Road Station as a catalyst for development in the Branch Avenue corridor (Table 1). The 2002 *Prince George's County Approved General Plan* (General Plan) designated the Naylor Road Station as a Community Center within the County's Developed Tier to encourage mixed-uses in support of the surrounding community. Prince George's County's Developed Tier includes the entire County inside the Beltway and contains more than half of the County's households and employment. The General Plan vision for the Developed Tier is a network of sustainable mixed-use medium-to high density communities that support transit and are oriented toward pedestrians. Policies for the Developed Tier emphasize quality infill and redevelopment, provision of adequate public facilities to serve existing and future residents, and preservation and enhancement of the environment.

Planning efforts that set development policies for Naylor Road were completed in the last five years. M-NCPPC's 2008 *Approved Preliminary Branch Avenue Corridor Sector Plan and Proposed*

Table 1: Previous Planning Studies for Naylor Road Station

| Plan Title | Lead Agency | Date |
|---|---|---|
| Prince George's County Approved General Plan | M-NCPPC | 10/2002 |
| Approved Preliminary Branch Avenue Corridor Sector Plan and Proposed Sectional Map Amendment | M-NCPPC | 9/2008 |
| Approved Countywide Master Plan of Transportation | M-NCPPC | 11/2009 |
| Metrorail Bicycle & Pedestrian Access Improvements Study | Metro | 10/2010 |
| Naylor Road Metro Station Area Accessibility Study | M-NCPPC | 5/2011 |
| Metrorail Station Access Alternatives Study | MWCOG | 7/2012 |
| MD 5 (Branch Avenue) and MD 637 (Naylor Road) Streetscape Improvements | SHA | 2013 |
| Metro Green Line Corridor Action Plan | M-NCPPC | 2013 |

*Sectional Map Amendment* (Branch Avenue Corridor Sector Plan) established policies and zoning to encourage mixed-use TOD within a half-mile radius of the Metrorail station. The plan recommended an urban mix of uses integrated with new office building within walking distance of the Naylor Road Metro Station. Specifically, the plan designated Naylor Road Station a Regional Center. Regional Centers are locations for regionally marketed retail destinations, office and employment areas, higher education facilities, and possibly sports and recreational complexes serving Prince George's County. High-density residential may be an option if the needed public facilities and services can be provided. Regional Centers feature high transit access. The plan recommended that Naylor Road Station employ the Mixed-Use Transportation-Oriented Zone.

However, as noted in M-NCPPC's 2009 *Countywide Master Plan of Transportation*, retrofitting Prince George's County Metrorail station areas in the Developed Tier (such as Naylor Road) into TOD communities has been a challenge. Many of these stations are isolated from nearby communities, as they were constructed alongside major transportation infrastructure like railroads or highways. For example, Suitland Parkway acts as a barrier between the Naylor Road station and communities to the north and west. In addition, the large amount of non-developable land surrounding the station—Suitland Parkway, Oxon Run Stream Valley Park, and Lincoln Memorial Cemetery—limit the development potential of the immediate Naylor Road Station area.

Support at the state level arrived in 2010, when Governor O'Malley formally designated the Naylor Road Station, among other locations throughout the state, as a TOD site. This designation ensures that State resources can assist in the development of plans and construction of projects at Naylor Road Station, including street improvements such as traffic calming measures and sidewalks installation and repair. Similar support from the U.S. Department of Housing and Urban Development (HUD) arrived in 2010 when the Department issued an $800,000 Sustainable Community Challenge Grant to M-NCPPC to prepare a corridor action plan for redevelopment and improved transportation connectivity along the Green Line between Southern Avenue Station and Branch Avenue Station. M-NCPPC will complete this study, the *Metro Green Line Corridor Action Plan*, in 2013.

Recent planning at the regional level supports Naylor Road's transformation into a TOD center by emphasizing and prioritizing nonmotorized station access. For example, Metro's *Metrorail Bicycle & Pedestrian Access Improvements Study* (2010) identified strategies to enhance bicycle and pedestrian access and connectivity in and around Metrorail stations. Metro categorized stations into one of nine typologies that vary by land use, adjacent transportation network, site layout, and mode split. Each station typology is paired with specific recommendations that may be applied to other stations that exhibit similar characteristics. For example, the study concluded that some of the primary issues for Naylor Road Station, as well as other stations that share comparable features, include barriers to cycling throughout the nearby communities and ensuring that future TOD is designed to encourage Metrorail ridership. The Metropolitan Washington Council of Governments (MWCOG) carried this station typology forward into its *Metrorail Station Access Alternatives Study* (2012), which examined how to maximize passenger access to Metrorail stations by 2040 under different scenarios. In MWCOG's study, Naylor Road Station, noted for its long-term potential for high-density TOD or planned unit development

(PUD), served as one of five case studies. The study found that Naylor Road Station could benefit from implementing targeted bus service improvements, satellite parking, and neighborhood bus service.

More detailed planning and design work continues at the state and county levels as well. In support of the Branch Avenue Corridor Sector Plan's call for improved pedestrian links to transit, Maryland State Highway Administration (SHA) initiated the *MD 5 (Branch Avenue) and MD 637 (Naylor Road) Streetscape Improvements* study (SHA Streetscape Project) to improve safety, multimodal access, and streetscape aesthetics along the periphery of Naylor Road Station. SHA's selected streetscape alternative, which is anticipated to enter construction in 2014, includes sidewalks on both sides of Branch Avenue, landscaped medians on Branch Avenue and Naylor Road, bicycle lanes on Branch Avenue and Naylor Road, on-street parking on Naylor Road, "Share the Road" signage, and ADA (Americans with Disabilities Act) intersection improvements. The *Naylor Road Metro Station Area Accessibility Study* (M-NCPPC Accessibility Study), completed by M-NCPPC in 2011, similarly developed bicycle and pedestrian recommendations around the station, including traffic calming, new striping, new or widened sidewalks, new signage, and new or modified signals. This study, funded through a grant provided by M-NCPPC's Transportation/Land Use Connections (TLC) Program, focused on low-cost, short-term bicycle and pedestrian access improvements within 1/2-mile of Naylor Road Station.

STATE LAW
STOP FOR
IN X-WALKS
TO TRAFFIC
IN CIRCLE
Good Hope
Ave
M metro
Kiss &
Ride

# Existing Station Area Characteristics

Naylor Road Station is located on the southern leg of the Green Line in suburban Prince George's County, Maryland and less than 1/4-mile from Washington, DC (Figure 2). The station is among the newest in the Metrorail system, opening in January 2001 as part of the final segment of the Green Line to Branch Avenue Station.

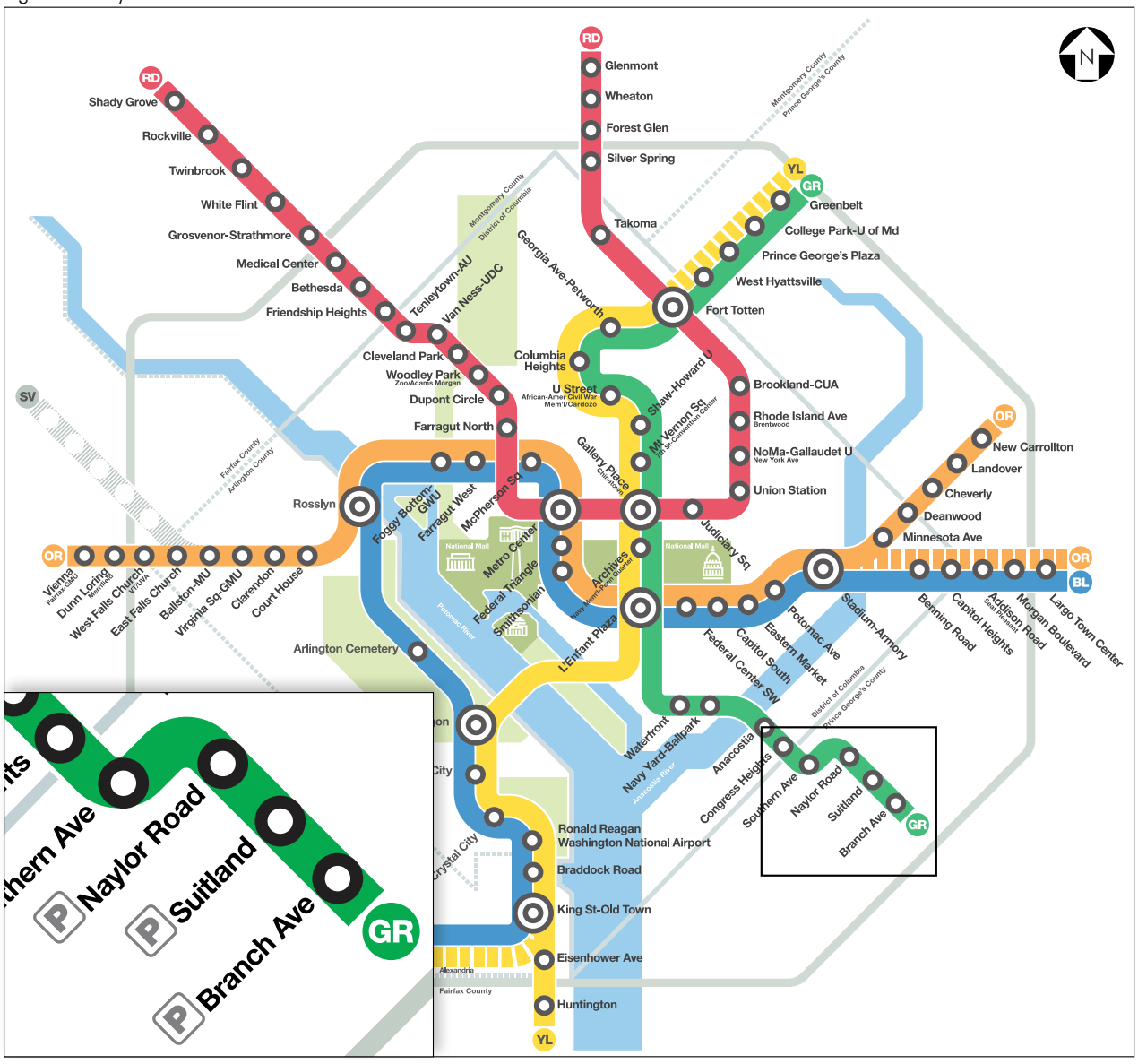
Figure 1: Existing Naylor Road Station Area Characteristics

*Source: Google Earth (bottom left)*

The study boundary is approximately 1/4-mile from the station entrance. The elevated station platform, south of and parallel to Suitland Parkway, is arranged in a center configuration with one access point connecting to a single mezzanine at ground level. All station area facilities are contained within three Metro-owned parcels totaling 7.6 acres.

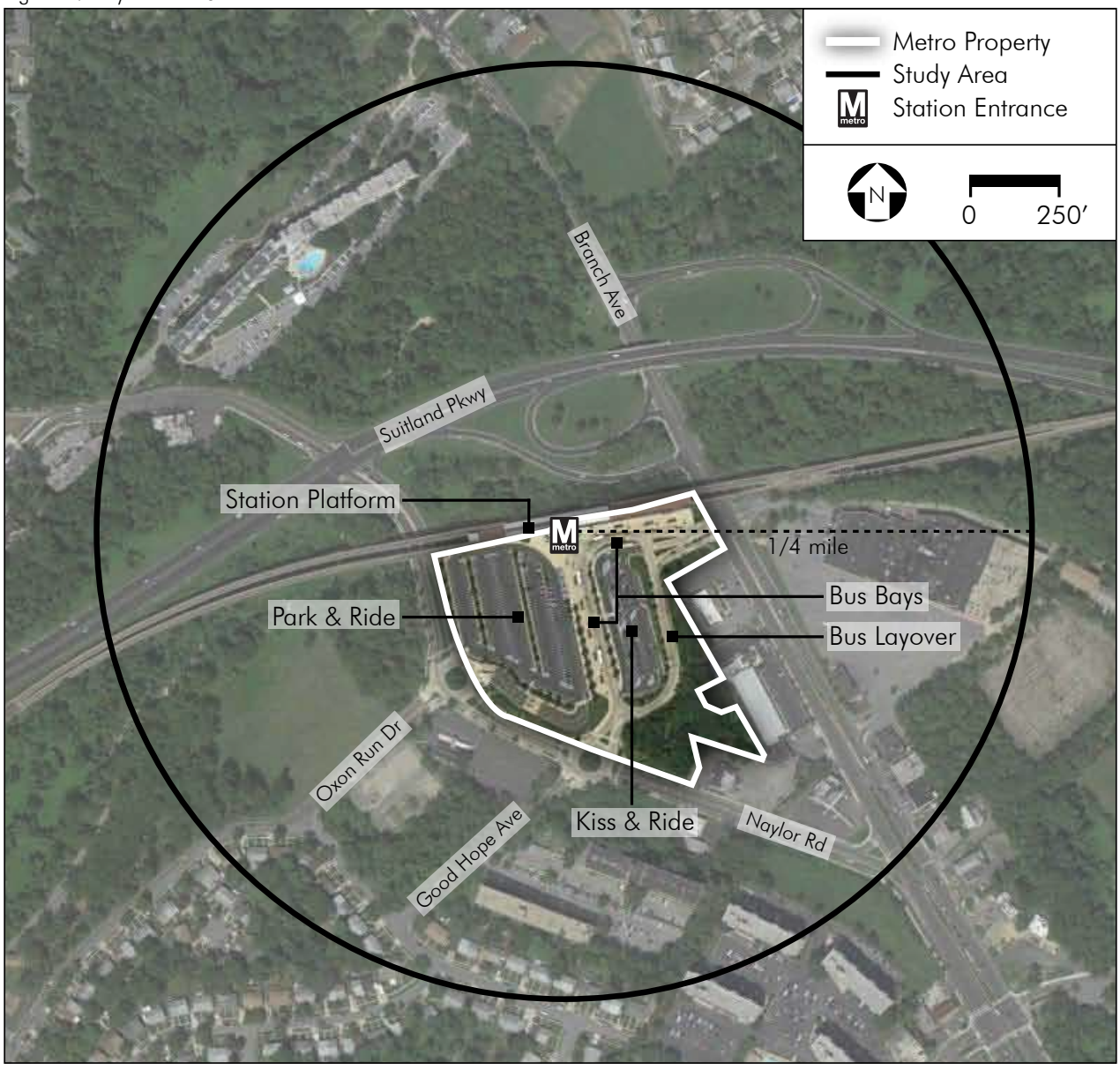
Station area facilities lie south of the platform and tracks and are bounded by Naylor Road (MD 637) to the west and south and Branch Avenue (MD 5) to the east (Figure 3). Naylor Road Station's eight bus bays, which wrap around its Kiss & Ride lot, serve 11 Metrobus and TheBus

Figure 2: Naylor Road Station Location



routes. Vehicle access is shared between these two facilities with entry/exit points at both Naylor Road and Branch Avenue. The Kiss & Ride lot contains 73 parking spaces: four handicap spaces, four Zipcar spaces, 10 motorcycle spaces, 13 "A-spaces" (reserved for waiting motorists), and 42 short-term metered spaces. A 368-space Park & Ride surface lot and its entrance roadway comprise the western half of the station area. Cyclists are accommodated at Naylor Road Station as well, with 10 bicycle racks and four bicycle lockers. Several local businesses are located directly adjacent to the Kiss & Ride lot, southeast of the station platform.

Figure 3: Naylor Road Station Facilities

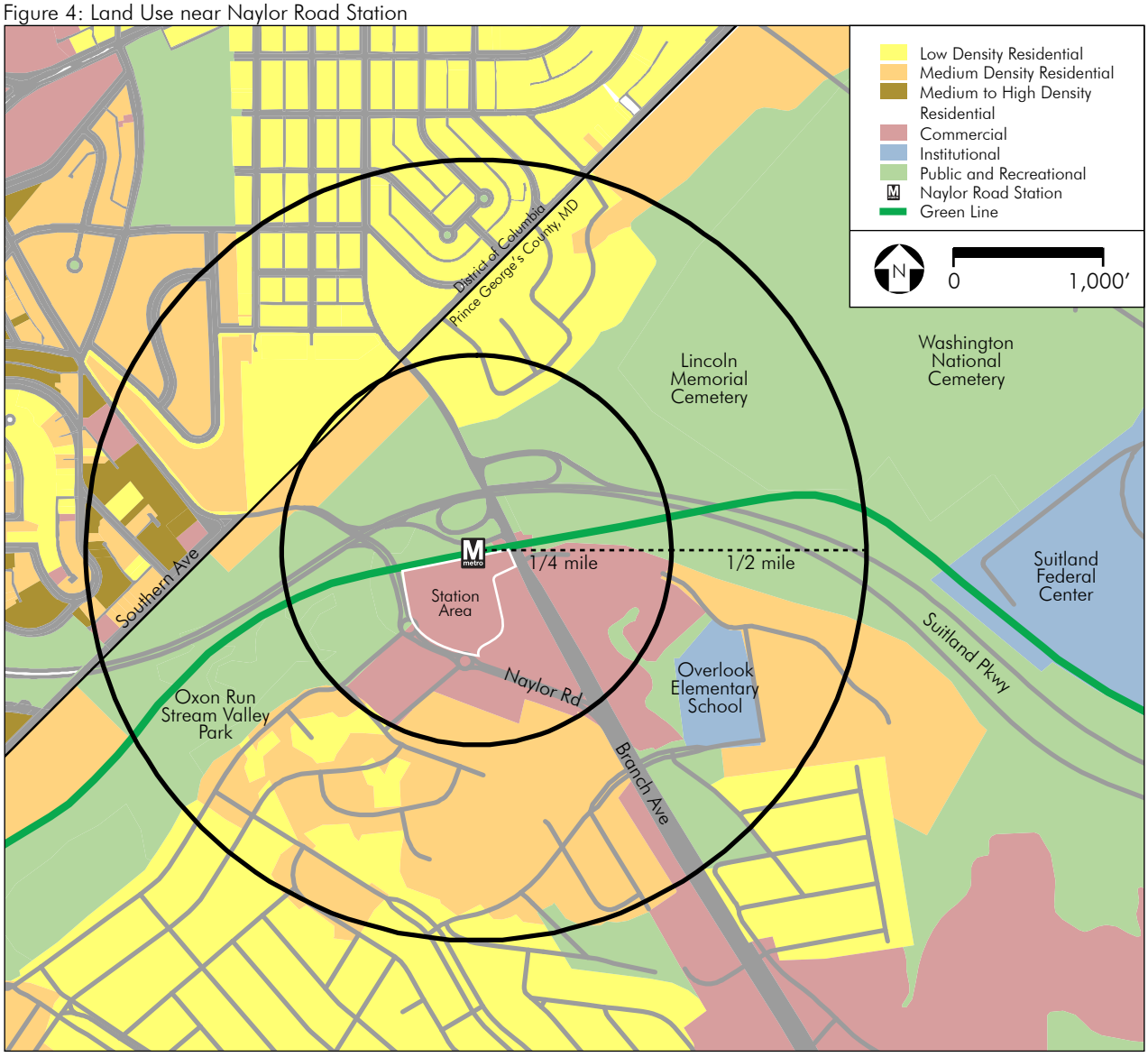



*Source: Google Earth (aerial)*

## Land Use

Naylor Road Station is located approximately six miles from Metro Center Station in the Hillcrest Heights community. Though relatively close to downtown Washington, DC, the station is also less than three miles from the Branch Avenue Metrorail station, the final stop on the southern leg of the Green Line. Naylor Road Station is largely surrounded by low-density single-family homes, though some high-density multi-family apartment buildings ranging between seven to nine stories are located to the immediate north and south. Commercial development is located along Branch Avenue and Naylor Road (Figure 4).

Figure 4: Land Use near Naylor Road Station




*Source: Maryland Department of Planning, DC Office of Planning*

The Naylor Road Station area and the Hillcrest Heights community contain a considerable amount of federally-owned land. A large, continuous span of parkland on either side of Suitland Parkway surrounds the station to the west, north, and east. The Lincoln Memorial Cemetery and Washington National Cemetery occupy large tracts of land about 1/4- to 1/2-mile east of the station. Adjacent to these cemeteries is the Suitland Federal Center, a considerably sized Federal office complex housing the U.S. Census Bureau, among other agencies.

Figure 5: Commercial Properties along Branch Avenue

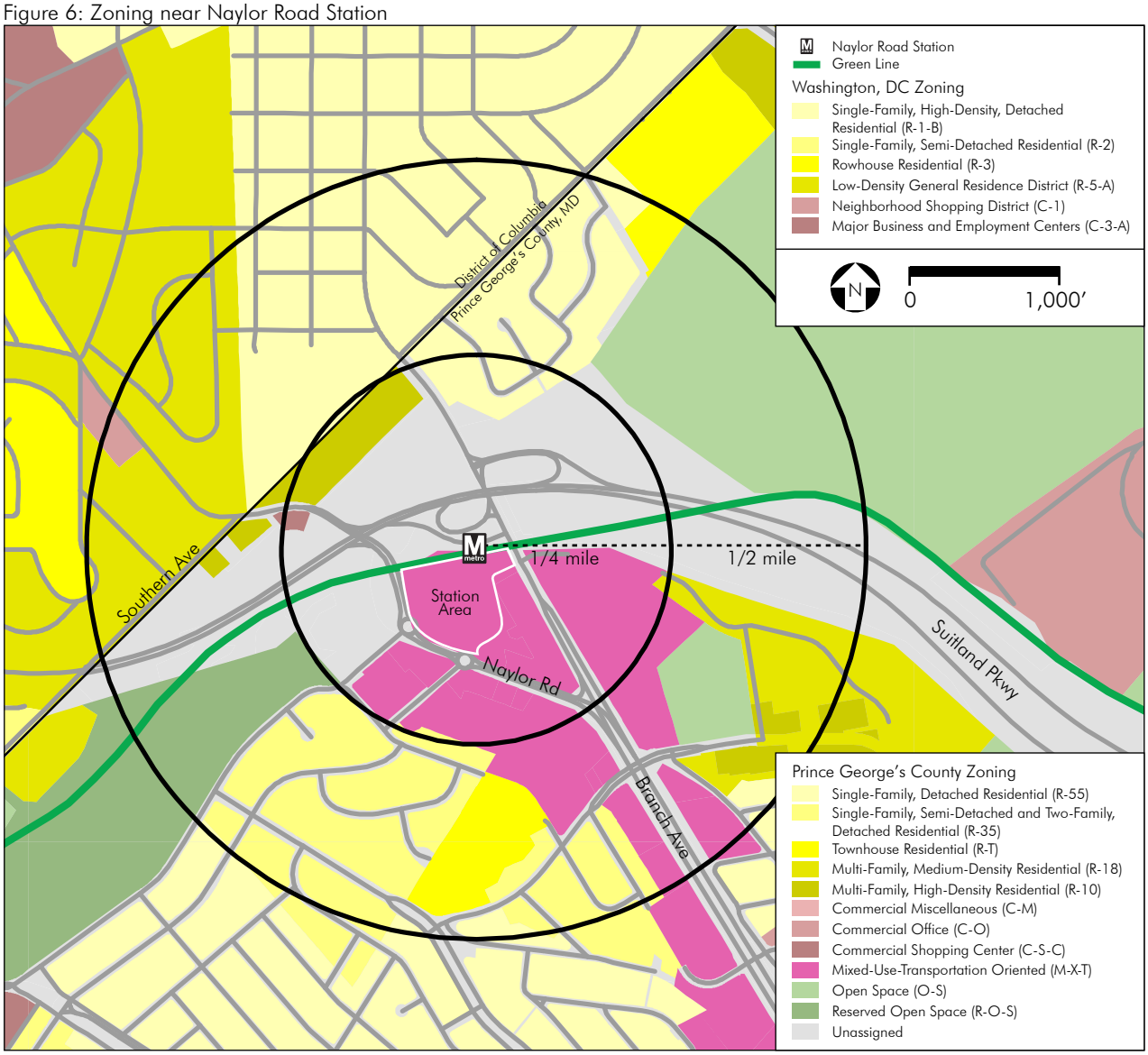
*Source: Google Earth*

Because Hillcrest Heights developed between the 1920s and 1960s, well before the arrival of Metrorail service in 2001, the station area's built environment is typical of low-density, automobile-oriented suburban communities throughout the metropolitan Washington region. Branch Avenue, the primary commercial corridor near the station, is characterized by aging strip-mall developments with surface parking lots, including a Budget Inn hotel, several take-out restaurants, and the Branch Metro Plaza Shopping Center, home of the Skate Palace skating center (Figure 5). Naylor Road, while less developed than Branch Avenue, includes the Legend Nightclub and a Shell gas station, among other businesses. Suitland Parkway—listed on the National Register of Historic Places and maintained by the U.S. National Park Service (NPS)—remains undeveloped.

## Zoning

With the exception of the Suitland Parkway greenspace north of Naylor Road Station, most land within a 1/4-mile walk to the station is zoned as Mixed-Use-Transportation Oriented (M-X-T), including land owned by Metro (Figure 6). Before being updated in 2008 by the Branch Avenue Corridor Sector Plan, zoning near Naylor Road Station and along Branch Avenue was almost exclusively assigned commercial uses, ranging from restaurants, retail, offices, and limited mixed-uses. The M-X-T zone has replaced commercial zones in these areas, and it requires that new buildings have at least two out of three following uses: retail businesses; office/research/industrial; and dwellings/hotel/motel. This zone was designed to support "24-hour functional environments" and is limited to locations close to major intersections and transit corridors. Increased density is permitted on property closer to Metrorail stations, as shown in the vision for Naylor Road Station from the Branch Avenue Corridor Sector Plan (Figure 7). There are no restrictions on lot sizes or dwelling types in the M-X-T zone, instead the regulations utilize a maximum floor-to-area ratio (FAR) calculation. The zone, however, lacks regulatory authority

Figure 6: Zoning near Naylor Road Station




*Source: Branch Avenue Corridor Sector Plan, Prince George's County, and DC Office of Zoning*

Figure 7: Vision for Naylor Road Station Area and Branch Avenue

*Source: Branch Avenue Corridor Sector Plan*

to require a pedestrian-friendly environment with new buildings, though these details are negotiated during the design phase.[1]

1. *Branch Avenue Corridor Sector Plan* (2008)

Developed land beyond the M-X-T zone is almost entirely zoned residential. A multifamily, high-density residential (R-10) zone is located within 1/4-mile of Naylor Road Station to the northwest. Large residential buildings are permitted in R-10 zones, though buildings exceeding 110 feet require special exception approval. Other nearby residential zones are predominantly lower-density attached, semi-detached, and detached housing. Large tracts of open space are also located nearby.

## Metrorail Ridership

Naylor Road Station averaged 3,160 entries and 3,138 exits per weekday during May 2012, a seven percent decline from the station's highest recorded ridership in 2006 with 3,402 entries. Peak hours of ridership occur from 7:00 to 8:00 AM in the morning and 5:00 to 6:00 PM in the afternoon.

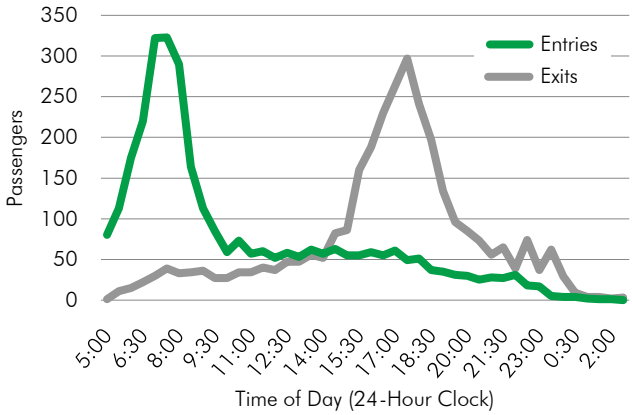
Table 2: Average Weekday Metrorail Ridership (May 2012)

| Time Period | | Entries | Exits | Total |
|---|---|---|---|---|
| Daily | | 3,160 | 3,138 | 6,298 |
| Morning Peak Hour | 7:00 to 8:00 AM | 645 | 69 | 714 |
| Afternoon Peak Hour | 5:00 to 6:00 PM | 110 | 560 | 670 |

*Source: Metro faregate data*

A large imbalance between entries and exits is observed during peak periods at Naylor Road Station (Figure 8), which is indicative of heavy use by daily commuters. Morning and afternoon peaking is very pronounced, with most people entering the station in the morning and exiting in the afternoon—an indication of few jobs in the area. During the general Metrorail systemwide morning peak period (5:00 to 9:30 AM), approximately eight passengers enter the station per every exiting passenger. Conversely, almost four passengers exit the station per every entering passenger during the afternoon systemwide peak period (3:00 to 7:00 PM).

Figure 8: Naylor Road Station Metrorail Ridership Pattern




*Source: Metro faregate data*

Midday entries remain relatively stable following the morning peak period until about 6:00 PM where they begin to decline. Exits slowly increase throughout the morning and midday periods, but greatly accelerate at 2:00 PM. Following the afternoon peak period, passenger exits inconsistently decline with some small surges of increased activity around midnight.

Peak period service along the Green Line has six-minute headways, while non-peak service has 12 minute headways. Table 3 summarizes typical rail frequencies at the Naylor Road Station for weekday and weekend time periods.

Table 3: Metrorail Frequency at Naylor Road Station

| Day | Period | Headway (minutes) |
|---|---|---|
| Weekday | Morning Peak | 6 |
| | Mid-day | 12 |
| | Afternoon Peak | 6 |
| | Early evening | 12 |
| | Late evening | 20 |
| Weekend | Morning to evening | 12-15 |
| | Evening | 20 |

Table 4: Access and Egress at Naylor Road Station

| Mode | 2007 Mode Shares* | | 2007 Mode Shares Applied to 2012 Passenger Totals | |
|---|---|---|---|---|
| | Access | Egress | Access | Egress |
| Walk | 24% | 12% | 760 | 377 |
| Bicycle | 0% | 0% | 0 | 0 |
| Bus | 37% | 54% | 1,170 | 1,695 |
| Kiss & Ride | 16% | 7% | 505 | 220 |
| Park & Ride (drivers and passengers) | 22% | 23% | 695 | 721 |
| Other (taxi, incomplete surveys) | 1% | 4% | 30 | 125 |
| Total | 100% | 100% | 3,160 | 3,138 |

*Source: 2007 Metrorail Passenger Survey, Metro faregate data*

** This mode share included satellite parking at the Legend Nightclub across Naylor Road*

## Station Access

Results from the *2007 Metrorail Passenger Survey* show an access and egress imbalance at Naylor Road Station (Table 4). The data shows that considerably more people exit the station by bus than enter by bus. This difference can also be seen in the walk and Kiss & Ride modes, as exits by these modes of travel are fewer than entries. Mode shares that significantly vary between entries and exits are atypical. These results are likely due to the small number of completed surveys for Naylor Road Station: 188 and 143 returned surveys with Naylor Road Station as the trip origin and destination, respectively.

Despite the results' uncertainty, it is reasonable to assume that real-world conditions fall somewhere between the access and egress results in Table 4.

### Pedestrian

Safe and efficient pedestrian access to Naylor Road Station is vital, as almost one in four Metrorail passengers access the station by foot. While the surrounding station area is fairly well connected by sidewalks of varying width and quality, many pedestrian facilities—sidewalks, crosswalks, signals, signage, etc.—in the station area need improvement and could potentially impact pedestrian safety. Nearby roadways, particularly Branch Avenue, serving as major pedestrian links are perceived as dangerous and uninviting for pedestrians, especially when crossing the street. The following key observations are the result of several site surveys to evaluate existing pedestrian access:

- Large number of pedestrians crossing in the morning and afternoon peak periods
- Speeding motorists on Branch Avenue
- Missing and narrow sidewalks along Branch Avenue, Oxon Run Drive, and Naylor Road
- Curb cuts on east side of Branch Avenue for commercial frontage impede pedestrian access
- Sidewalk conditions could be enhanced on Branch Avenue
- Traffic signals oriented to automobile traffic and not the pedestrian
- No striped crosswalks on Branch Avenue and pedestrian refuge too narrow
- Deteriorating street surfaces
- Numerous access points, power poles, and signage create obstacles along sidewalks
- Several impromptu unpaved paths (desired paths to station area) in the station area

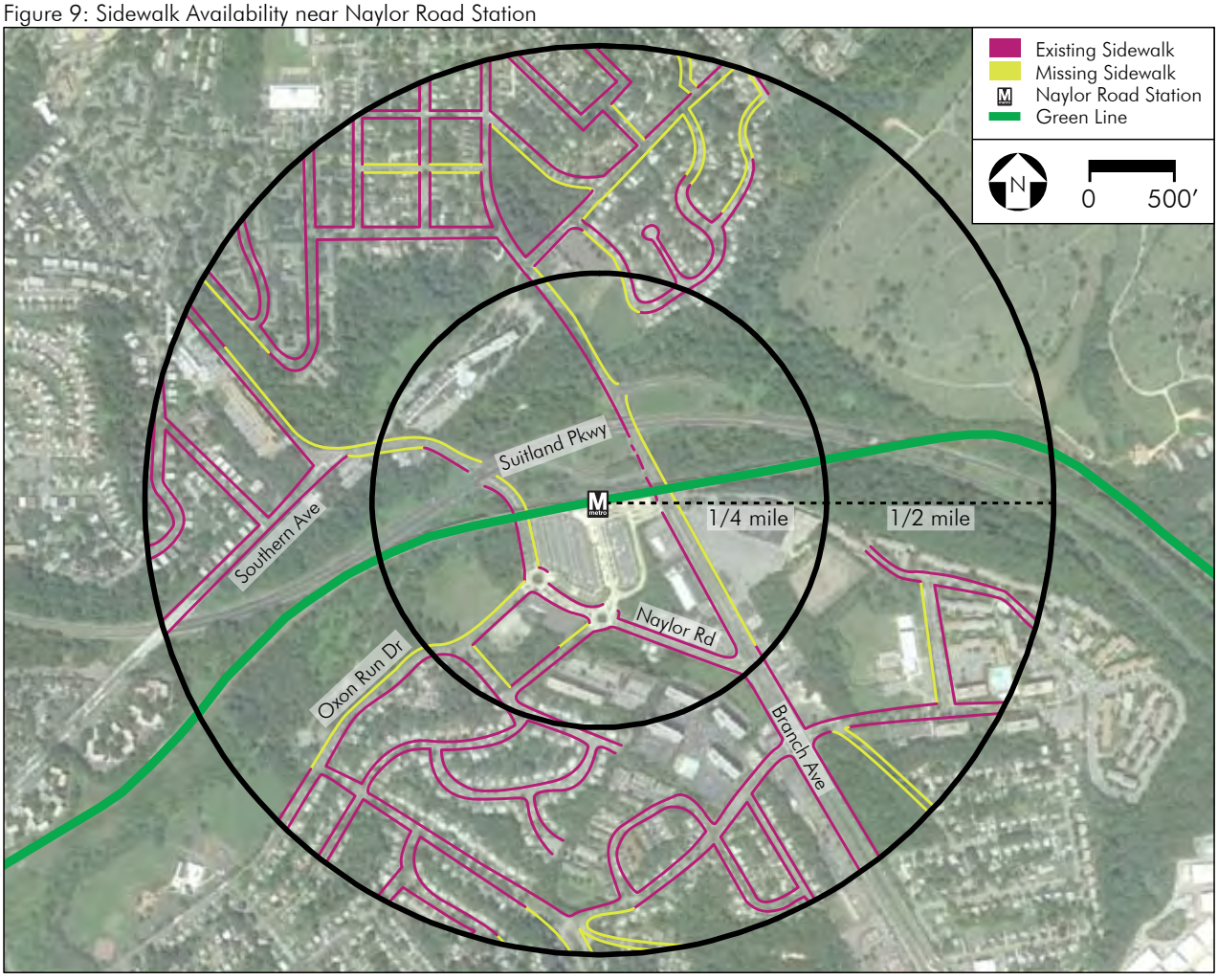
These pedestrian safety and connectivity concerns have been echoed in other planning studies, notably the SHA Streetscape Project and M-NCPPC Accessibility Study. Recommendations from these studies will be discussed later in this report.

## Sidewalks

Sidewalk coverage of varying width and quality is fairly extensive near Naylor Road Station (Figure 9). However, sidewalks are missing on the most direct pedestrian routes of Branch Avenue, Naylor Road, and Oxon Run Drive, and some sidewalks are not wide enough for pedestrians to pass one another. Because most pedestrians can only access the station by walking along these roadways, a lack of sidewalks, even if only on one side of a roadway, is a significant issue.

Sidewalks on Branch Avenue, when present, are narrow and, north of Curtis Drive to the District line, lack a vegetated buffer to separate high-speed traffic. These sidewalks are often poorly maintained. Branch Avenue sidewalks are frequently interrupted by curb cuts that provide vehicle access to aging commercial buildings and increase the number of potential conflict points between vehicles and pedestrians (Figure 10).

Figure 9: Sidewalk Availability near Naylor Road Station




*Source: Google Earth (aerial)*

Figure 10: Curb Cuts on Branch Avenue

*Source: Google Earth (aerial)*

Figure 11: Naylor Road Sidewalk

Figure 12: Missing Sidewalk along Naylor Road

Naylor Road's four-foot-wide sidewalks are in good condition as they are relatively new compared to sidewalks along Branch Avenue. Most of Naylor Road sidewalks are separated from the roadway by a vegetated buffer (Figure 11). Sidewalks are missing on the east side of Naylor Road between Oxon Run Drive and Southern Avenue. Many pedestrians prefer to walk along the east side of Naylor Road and have thus created a worn pathway (Figure 12). Narrow and missing sidewalks are also found on Oxon Run Drive, one of the few direct pedestrian connections to the station from residential neighborhoods to the south.

## Unpaved Pathways

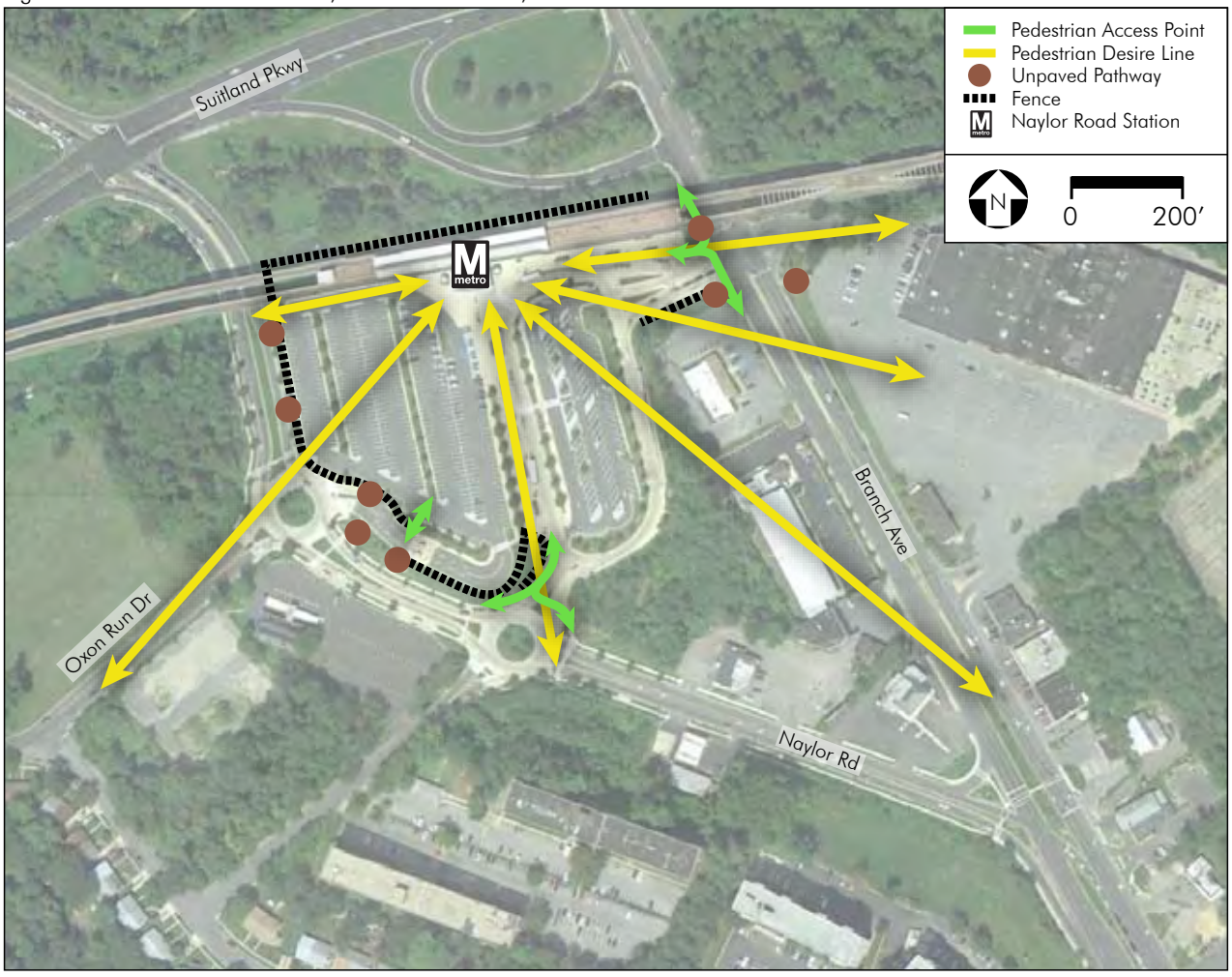
Pedestrian access at the station area boundary is made more difficult due to few access points that often do not follow pedestrian desire lines. A barbed-wire fence encloses the station area perimeter, which funnels pedestrians into only two access points: the station entrance at Branch Avenue and the Good Hope Avenue station entrance roundabout. As a result, pedestrians have created several worn, dirt pathways from repeatedly walking where no sidewalks exist to access impromptu points of access (Figure 13). These worn pathways, often called "goat trails," are important indicators of where the pedestrian infrastructure is not meeting the needs of the walking public, and where targeted improvements are likely to have a positive impact.

Station observations found that Branch Avenue is the most popular pedestrian entrance because it provides quick access to nearby businesses in the area, including the Branch Metro Plaza Shopping Center. Pedestrians so frequently walk between the station and the shopping center that they have worn the ground into an ad-hoc pathway on the east and west sides of Branch Avenue (Figure 14). This unplanned pathway represents a natural desire line (i.e. the most convenient and often shortest pedestrian path between two points).

The Oxon Run Drive entrance also exhibits worn pathways that demonstrate pedestrian desire lines. The Oxon Run Drive station entrance roundabout serves the Park & Ride lot and lacks a continuous sidewalk to safely guide pedestrians to the station entrance. However, pedestrians continue to enter and exit the station area through this access point because it is convenient. Pedestrians utilize an opening in the Park & Ride fence near the payment booth, which was originally created for quicker access to the booth by Metro employees (Figure 15). Pedestrians walk through the Park & Ride lot when using this impromptu access point.

Pedestrians arriving from Naylor Road north of Suitland Parkway have accessed the station in the past by creating a hole in the fence at the northwest corner of the Park & Ride lot to reduce walking times to the station entrance. This opening, however, is currently mended with a more durable fence (Figure 16). Pedestrians have also created a dirt pathway along the east side of Naylor Road where a sidewalk presently does not exist (Figure 12).

Figure 13: Pedestrian Desire Lines, Pedestrian Barriers, Informal Paths




*Source: Metro Pedestrian and Bicycle Element of 2012-2017 Capital Improvement Program, Google Earth (aerial)*

Figure 14: Worn Pathway at Branch Avenue Station Entrance

Figure 15: Worn Pathways at Oxon Run Drive Park & Ride Entrance

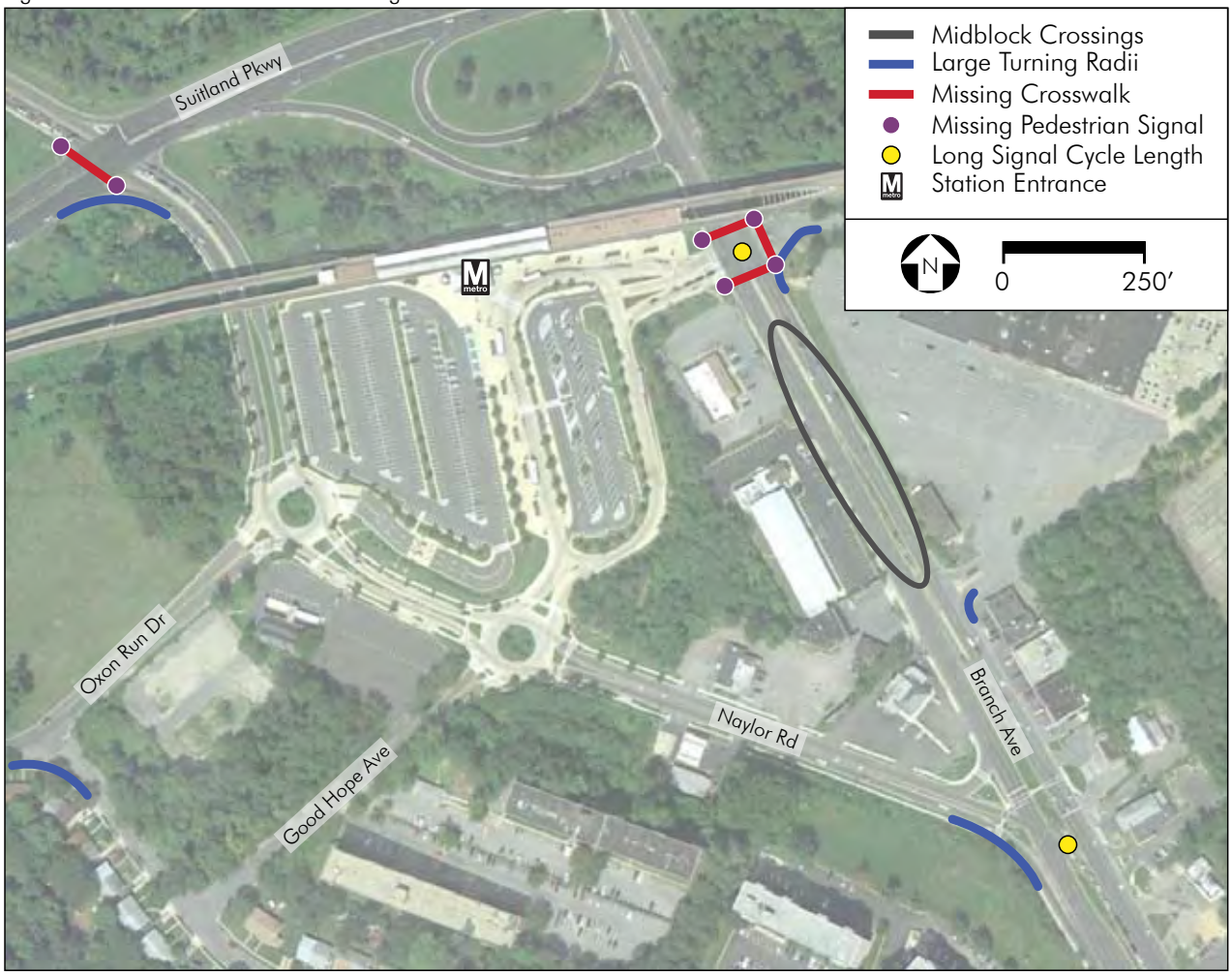
Figure 16: Reinforced Fence at Northwest Corner of Park & Ride

## Crossings

Multistory residential towers (Marlborough House, Top of the Hill Apartments, and Carriage Hill Apartments) and single-family residential neighborhoods north and south of the station generate large numbers of Suitland Parkway and Naylor pedestrian crossings. Similarly, many pedestrians travel to the station from origins east of Branch Avenue, requiring pedestrians to cross this busy roadway. Nine collisions involving pedestrians or cyclists occurred along Branch Avenue during between 2007 and 2009. While Naylor Road intersections exhibit some crossing amenities, there is a great need for safe crossings and ADA improvements, especially at intersections that lack pedestrian crossing amenities (Figure 17).

The Suitland Parkway and Naylor Road intersection and the Branch Avenue station entrance intersection present serious pedestrian safety issues. These intersections are missing crosswalks,

Figure 17: Observed Pedestrian Crossing Issues




*Source: Station observations, Naylor Road Metro Station Area Accessibility Study, Google Earth (aerial)*

Figure 18: Pedestrian Amenities at Naylor Road and Branch Avenue Intersection

Figure 19: Station Access at the Good Hope Avenue Roundabout

Figure 20: Pedestrian Crossing Branch Avenue Midblock

pedestrian signals, and sidewalks, and are among the busiest pedestrian crossings in the study area. When crossing Suitland Parkway, pedestrians must cross right-turn slip lanes with large turning radii. Additional study-area intersections exhibit large turning radii, which allow motorists to turn at high speeds. Only the Branch Avenue and Naylor Road intersection features a push-button pedestrian countdown timer.

Naylor Road's roundabouts, in contrast, include crosswalks and ADA-complaint curb ramps (Figure 19). While several Naylor Road intersections were upgraded a few years ago with prominent crosswalk striping, median refuges, and pedestrian signage, its pedestrian crossings continue to present safety issues. Station observations revealed that pedestrians frequently run across Naylor Road at designated crosswalks because the roundabouts fail to provide adequate breaks in heavy traffic.

In addition, pedestrians continue to cross Branch Avenue midblock in the vicinity of the station entrance (Figure 20). The nearest marked crossing of Branch Avenue, located at the Naylor Road intersection, is approximately 1,000 feet from Branch Avenue station entrance. Despite the lack of crosswalks or pedestrian signals, pedestrians cross Branch Avenue midblock because doing so can reduce travel time and thus increase convenience.

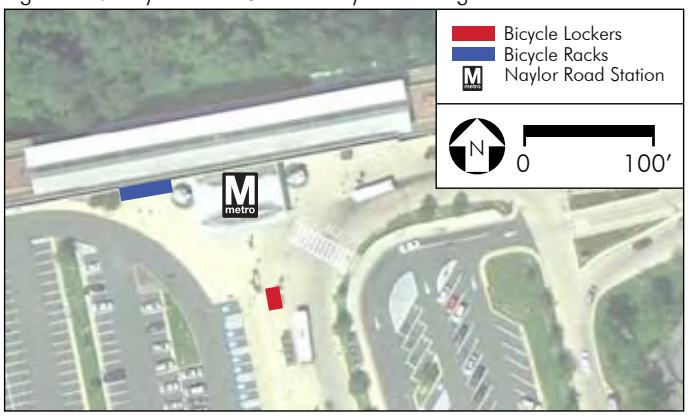
## Wayfinding Signage

Pedestrian wayfinding signage surrounding Naylor Road Station is limited. Wayfinding sign designs range from small signs with a logo and arrow only, to large signs with arrows indicating where station facilities are located (Figure 21). All of these signs are oriented to motorists, not pedestrians, and lack information about points of interest within the local community.

Figure 21: Existing Wayfinding Signage near Naylor Road Station

Figure 22: Naylor Road Station Bicycle Racks and Lockers

Figure 23: Naylor Road Station Bicycle Parking




*Source: Google Earth (aerial)*

## Bicycle

Branch Avenue is perceived as a dangerous place for cyclists as well. The following key bicycle observations are the result of several site surveys to evaluate existing bicycle access:

- Speeding on Branch Avenue
- Curb cuts on east side of Branch Avenue for commercial frontage increase the number of conflict points between cyclists and vehicles
- Deteriorating street surfaces
- No existing bicycle connection from the station to Oxon Run Trail

Current demand for bicycle parking is low. Very few passengers bike to Naylor Road Station as a result of limited cycling facilities in the area as well as the station's location amidst regional commuter roadways with heavy traffic. Ten bicycle racks and four bicycle lockers are located near the station entrance (Figure 22). All racks are located west of the station entrance while the lockers are found south of the entrance (Figure 23). As of December 2012, no bicycle lockers at Naylor Road Station are rented.

No bike lanes, multi-use trails, or designated shared-use roadways connect directly to Naylor Road Station. However, residential roadways south of the station provide a safe alternative due to low traffic volumes and direct access via Good Hope Avenue.

## Bus

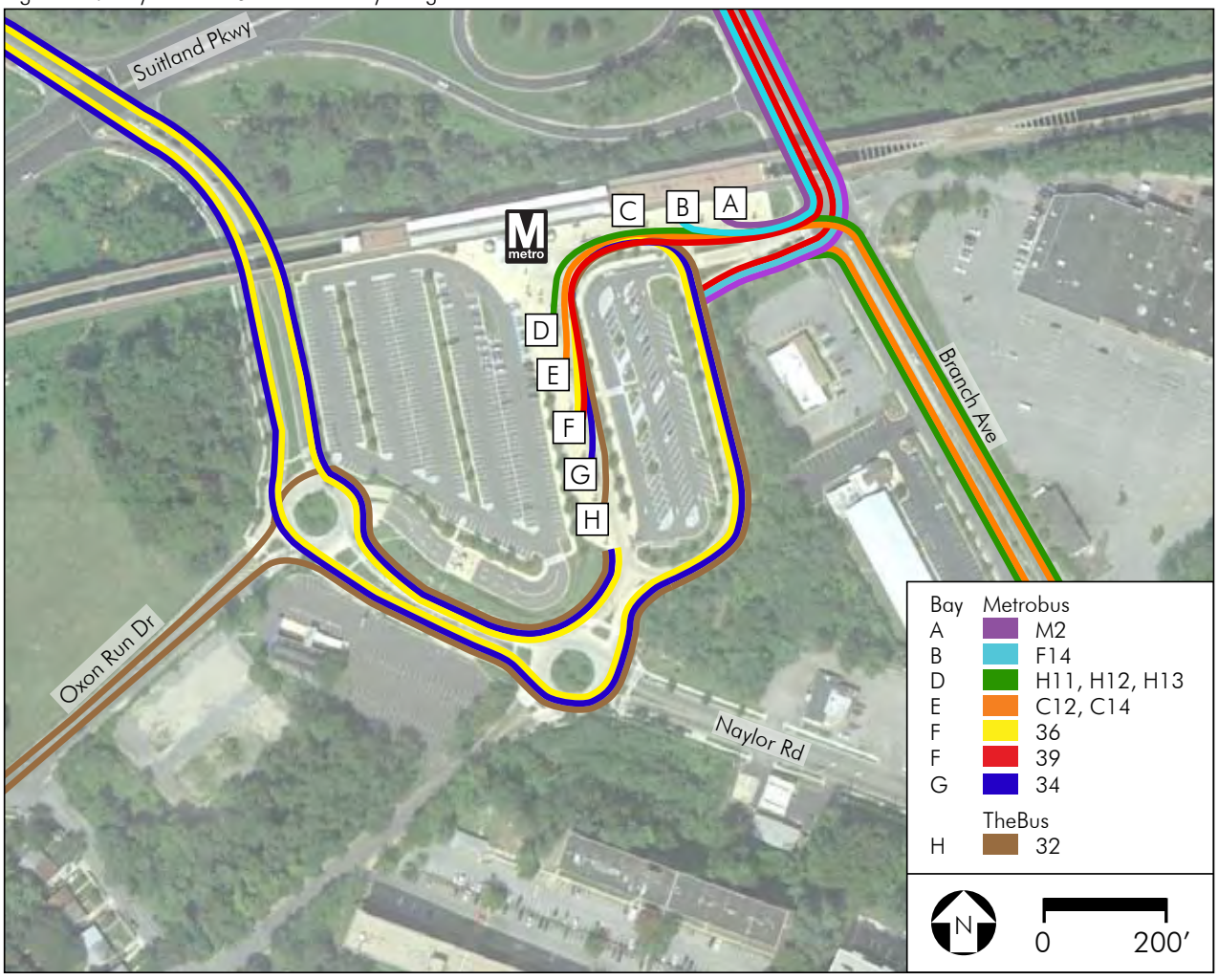
Naylor Road Station is served by Metrobus and Prince George's County's TheBus (Figure 24 and Table 5), with 26 and 23 buses arriving during the morning peak hour (7:30 to 8:30 AM) and afternoon peak hour (5:00 to 6:00 PM), respectively. Metrobus service hours of operation vary considerably depending on the route. Typical Metrobus service frequencies (headway) for routes serving Naylor Road Station vary from 20 to 30 minutes during

the morning and afternoon peak periods and 30 to 45 minutes during off peak periods. Some routes do not operate on Sundays.

Metrobus routes 34, 36, 39, C12, C14, F14, H11, H12, H13, and M2, and TheBus route 32 directly serve the station's eight saw-tooth bus bays. However, only seven bays have a route assigned. Bay C, located near the station entrance, serves as a passenger drop-off location for all routes. Bay F, which is utilized by Metrobus routes 36 and 39, is the most frequently-served bay at Naylor Road Station, with eight buses during the morning peak hour and six during the afternoon peak hour. Bays C and D are large enough to accommodate articulated buses.

Buses access Naylor Road Station bays from one of two locations—at Branch Avenue and at Naylor Road—that are shared with the Kiss & Ride lot located inside the counterclockwise bus

Figure 24: Naylor Road Station Bus Bay Assignments




*Source: Google Earth (aerial)*

loop. The Branch Avenue entrance intersection is controlled via traffic signal, permitting left turns into and out of the station. Along the southern edge of the station area, the shared Naylor Road bus loop and Kiss & Ride entrance features a roundabout. Bus drivers often experience delay when exiting the station at this location during peak hours as a result of heavy through traffic on Naylor Road.

Most bus bays are located along the west side of the bus loop, though Bays A through C are located along its northern edge parallel to the station platform (Figure 24). Up to four buses can layover along the bus loop roadway east of the Kiss & Ride. While the loop design of the bus bay area allows for easy recirculation after layover for most routes, buses can only access Bays A and B from Branch Avenue, and not from the bus loop itself. Routes serving these bays layover at their assigned bay.

Table 5: Bus Bay Assignments

| Bay | Route | Destination | Serving | Operator | Headway | | |
|---|---|---|---|---|---|---|---|
| | | | | | Morning | Midday | Afternoon |
| A | M2 | Fairfax Village | Southern Ave | Metrobus | 20 | - | 20 |
| B | F14 | New Carrollton | Bradbury Hts, Addison Road, Capital Heights, Landover Mall, Glenarden | Metrobus | 30 | 50 | 30 |
| C | Unassigned | | Used as a drop-off area | - | - | - | - |
| D | H11 | Temple Hills | Hillcrest Heights, Marlow Heights, Marlow Overlook | Metrobus | - | - | 15-30 |
| | H12 | Temple Hills | Hillcrest Heights, Marlow Heights, Marlow Overlook | Metrobus | 18-35 | 60 | - |
| | H13 | Temple Hills | Branch Ave direct | Metrobus | 20 | - | - |
| E | C12 | Branch Ave | Carriage Hill, Hillcrest Heights, Applegate | Metrobus | - | - | 25 |
| | C14 | Branch Ave | Carriage Hill, Iverson Mall, Applegate | Metrobus | 30 | 60 | - |
| F | 36 | Friendship Heights | Hillcrest, Branch Ave, Penn Ave, Wisconsin Ave | Metrobus | 15-30 | 30 | 15-30 |
| | 39 | Potomac Pk/ State Dept | Southern Ave, Penn Ave, Limited Stop | Metrobus | 15 | - | - |
| G | 34 | Archives | Naylor Rd, Penn Ave, Eastern Market, 7th St | Metrobus | 20 | 30 | 15 |
| H | TB32 | Clinton | Iverson Mall, Camp Springs, Kaiser Permanente | TheBus | 30 | 30 | 30 |

Figure 25: Naylor Road Station Bus Bays

The current eight bus bays are underutilized, with four of the seven revenue bays less than 50 percent occupied during the daily peak hour (Table 6). Nearly twice the number of buses currently serving Naylor Road Station could be accommodated with the existing configuration.

Despite the relatively low utilization of its bus bays, many passengers enter and exit buses at Naylor Road Station. Roughly the same number of passengers board a bus as board a train at the station, as summarized in Table 7.

Station observations revealed that use of Bay C, the unassigned drop-off bay, is inconsistent. Most, but not all, drivers prefer to stop just beyond Bay C near the station entrance, and in proximity to a fire hydrant. Many drivers remain at the drop-off location instead of proceeding to their assigned bay, blocking its use by other drivers who then temporarily double park and unload passengers. During field observations for this study, a double-parked bus conducted a driver change, blocking all buses behind it.

The station area appears in to be in good condition overall, though litter is sometimes an issue and Bays F and G are missing bus maps as of June 2012. Bay C does not display a bus map either, but it is not assigned a specific bus route. In addition, motorists mistakenly enter the bus-only area from the Branch Avenue entrance due to poor signage and very short site distance. Motorists are allowed 70 feet before realizing they must stay to the left to access the Kiss & Ride lot, as shown in Figure 26.

Figure 26: Shared Bus Bay and Kiss & Ride Entrance at Branch Avenue

Table 6: Bus Bay Utilization during the Daily Peak Hour

| Route | Provider | Bus Bay | Buses per Peak Hour | Total Time at Bay (minutes) | Bay Utilization |
|---|---|---|---|---|---|
| M2 | Metrobus | A | 3.0 | 24 | 40% |
| F14 | Metrobus | B | 2.0 | 20 | 33% |
| Drop-off | N/A | C | N/A | N/A | N/A |
| H11-13 | Metrobus | D | 4.0 | 44 | 73% |
| C12, C14 | Metrobus | E | 2.4 | 22 | 36% |
| 36, 39 | Metrobus | F | 8.0 | 76 | 127% |
| 34 | Metrobus | G | 4.0 | 40 | 67% |
| TB32 | TheBus | H | 2.0 | 26 | 43% |

Table 7: Typical Weekday Station Activity

| Mode | Daily Entries | Daily Exits |
|---|---|---|
| Metrorail | 3,160 | 3,138 |
| All Buses | 3,250 | 3,250 |
| Total | 6,410 | 6,388 |

*Source: Metro faregate data (2012), MWCOG 2008 Regional Bus Survey*
*Note: Bus values are approximate*

Beyond the bus loop bus bays, only one bus stop is located within the study area (1/4-mile from Naylor Road Station): a southbound stop on Branch Avenue near the District line (Figure 27). This and other stops near the station but not within the study area lack amenities such as shelters, benches, or bus schedules. Some stops south of the station lack sidewalk access entirely or are located near intersections without ADA-compliant curb ramps.

Branch Avenue bus stop amenities vary by location (Figure 28). The northbound Branch Avenue bus stop near the District line lacks a sidewalk, shelter, and bench, while two other Branch Avenue stops near the station lack shelters and benches but are located on sidewalks. The

Figure 27: Bus Stops near Naylor Road Station

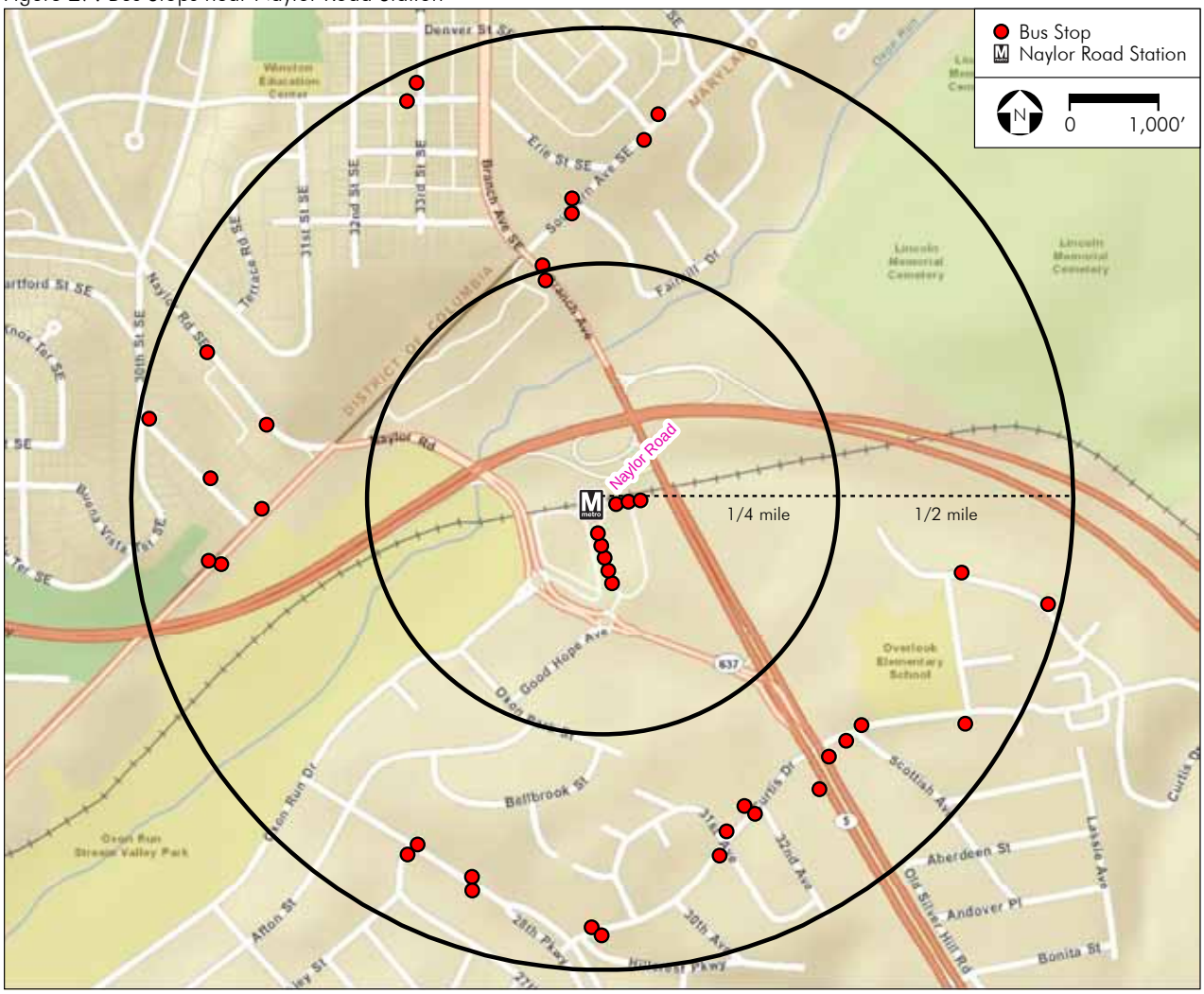



Figure 28: Amenities Vary at Branch Avenue Bus Stops: SB at Curtis Drive (left) and NB at Southern Avenue (right)

*Source: Google Earth (right)*

southbound Branch Avenue bus stop at Curtis Drive—the most complete bus stop in the area—includes a sidewalk, shelter, bench, and NextBus phone number sign.

## Shuttle

No private shuttles currently provide service to Naylor Road Station. As summarized in Metro's *Shuttle Services at Metro Facilities* study (2011), Metrorail stations that are served by private shuttles are most often close, but beyond a reasonable walking distance (about 1/2 mile), to high-density offices and apartment or condominium buildings. Naylor Road Station's lack of private shuttle service is indicative of a lack of similar activity centers near the station. For example, proximate high-density apartment and condominium buildings are well within 1/2-mile from the station, and with the exception of Suitland Federal Center, which is adjacent to Suitland Station, high-density office space is absent from the community. In addition, major roadways surrounding the station are well served by existing bus routes, reducing the market for private shuttles.

However, station observations for the *Shuttle Services at Metro Facilities* study showed that automobile dealerships are a common source for appointment-only shuttles to Metrorail stations. While these shuttle services were not observed at Naylor Road Station, many dealerships are located several miles to the southeast in Marlow Heights along St. Barnabas Road and Branch Avenue. It is possible that some dealership shuttles may infrequently serve Naylor Road Station due to customer requests despite that most of these dealerships are closer to Suitland Station or Branch Avenue Station.

## Vehicular Access

### Nearby Roadways

Branch Avenue, Naylor Road, and Suitland Parkway–roadways surrounding Naylor Road Station—are heavily traveled. While Branch Avenue and Suitland Parkway primarily provide access for regional travelers, Naylor Road provides more local access. Table 8 summarizes characteristics of these roadways.

Table 8: Naylor Road Station Area Roadway Characteristics

| Roadway | Functional Classification | Travel Lanes | Speed Limit | Median |
|---|---|---|---|---|
| Branch Avenue | Urban Freeway/Expressway | 5 | 30 | Landscaped |
| Naylor Road | Urban Minor Arterial | 2 | 25 | Landscaped/Center Turn Lane |
| Suitland Parkway | Urban Freeway/Expressway | 4 | 45 | Landscaped |

*Source: SHA State Highway Location Reference*

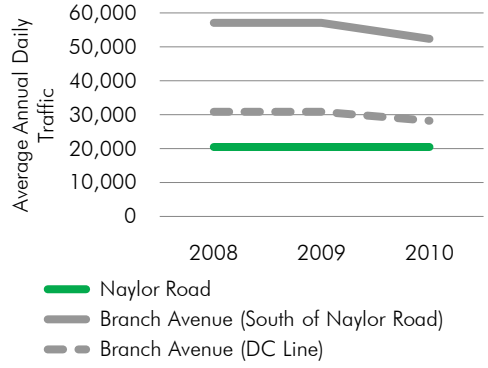
Branch Avenue (MD 5) is primarily a major north-south urban freeway/expressway. Near the station, however, it functions more as a traditional arterial with a speed limit of 30 miles per hour and several signal-controlled intersections. This segment of Branch Avenue is a five-lane (three southbound lanes and two northbound lanes) divided roadway with multiple access points to adjacent commercial development.

Naylor Road (MD 637) is a two-lane Urban Minor Arterial with two traffic circles, each at a Naylor Road Station area access point (Oxon Run Drive and Good Hope Avenue). In Prince George's County, Naylor Road connects Branch Avenue with the District line in an east-west direction.

Figure 29: Naylor Road (left), Suitland Parkway (right), and Branch Avenue (bottom)

*Source: Andrew Bossi (Creative Commons)*

Figure 30: Average Annual Daily Traffic near Naylor Road Station




*Source: SHA*

Suitland Parkway is owned and operated by NPS and classified as an urban expressway/freeway. It primarily serves trips passing through the project area, with access points at both Naylor Road (at-grade intersection) and Branch Avenue (grade-separated interchange). Suitland Parkway is a barrier to a connected network of local roads. A large portion of traffic between the District and the County uses the at-grade Naylor Road intersection because Southern Avenue is discontinuous between Naylor Road and Branch Avenue. The break in Southern Avenue forces traffic into Prince George's County and increases congestion near Naylor Road Station. The system of residential streets serving the station area is haphazard and disconnected.

Figure 30 shows that Branch Avenue's annual average daily traffic (AADT) volumes vary considerably between Naylor Road and the District line, as much of Branch Avenue's traffic likely turns onto Suitland Parkway or Naylor Road, and to a lesser extent into Naylor Road Station and nearby shopping and restaurants.

Crash data, summarized in Table 9 and provided by SHA as recorded by police reports, reveals that Branch Avenue experiences more collisions than Naylor Road.

Table 9: Crash Data

| Crash Type | 2006 | 2007 | 2008 | Total |
|---|---|---|---|---|
| Branch Avenue (Curtis Drive to Suitland Parkway) | | | | |
| Fatal | 0 | 0 | 0 | 0 |
| Injury | 21 | 19 | 20 | 60 |
| Property | 19 | 33 | 15 | 67 |
| Total | 40 | 52 | 35 | 127 |
| Naylor Road (Metrorail tracks to Branch Avenue) | | | | |
| Fatal | 0 | 0 | 0 | 0 |
| Injury | 3 | 3 | 4 | 10 |
| Property | 6 | 4 | 2 | 12 |
| Total | 9 | 7 | 6 | 22 |

*Source: SHA*

While some of these collisions may be attributed higher traffic volumes on Branch Avenue, the crash rate (i.e. typically the number of crashes per million or 100 million vehicle miles traveled, or VMT) appears comparatively high to Naylor Road. For year 2008—the only year available for comparison as AADT data is from 2008 to 2010 and crash data is from 2006 to 2008—Branch Avenue's total crash rate (420 crashes per 100 million VMT) is more than two times Naylor Road's rate (201 crashes per 100 million VMT), as calculated using the Federal Highway Administration's (FHWA) formula (Appendix 9). Total collisions dropped on Branch Avenue and Naylor Road between 2006 and 2008, though Branch Avenue property crashes increased greatly in 2007 before dropping in 2008. In contrast to SHA ranking Prince George's County first in Maryland in 2008 traffic fatalities, no roadway fatalities occurred between 2006 and 2008 near Naylor Road Station.

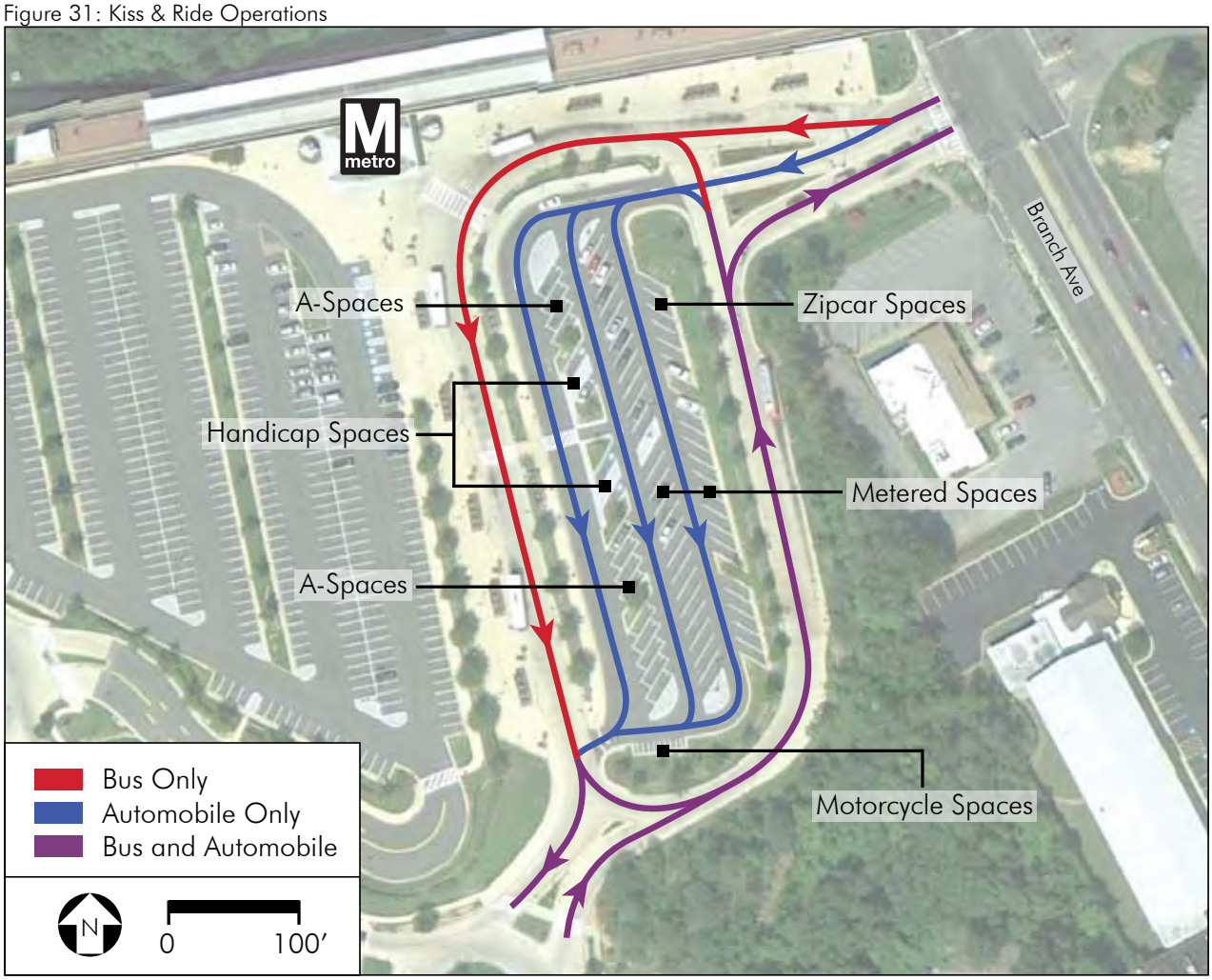
## Kiss & Ride

The Naylor Road Station Kiss & Ride lot includes a taxi stand, 13 A-spaces (15-minute temporary parking at all times), 42 short-term metered spaces (free 15-minute parking during peak periods), four Zipcar spaces, four handicap spaces, and 10 motorcycle spaces. During the afternoon peak period, when the greatest incidence of motorists waiting to pick up rail passengers typically takes place, 55 temporary parking spaces are available (13 A-spaces and 42 short-term metered spaces). Handicap, motorcycle, and Zipcar spaces, as well as the taxi stand, are omitted from any analysis of Kiss & Ride capacity, as they are not available to most motorists picking up passengers.

Field observations conducted during the afternoon peak period at Naylor Road Station in August 2011 showed that the average dwell time for vehicles in the Kiss & Ride is approximately 2.7 minutes. Rounding this figure up to three minutes and adding a 30-second buffer between vehicles using the same space yields a capacity of one vehicle per space every 3.5 minutes, or 17 vehicles per hour for each space. Factored by the 55 available spaces, that results in an overall Kiss & Ride capacity of approximately 935 vehicles per hour. Considering that the station ridership estimates that the maximum daily Kiss & Ride pickups are approximately 505 (see Table 4), there is ample capacity to accommodate all users in the Kiss & Ride lot (Figure 32). Even if all 505 maximum daily pickups occurred in a single hour, the Naylor Road Kiss & Ride would only require approximately 30 temporary parking spaces to accommodate demand.

Nevertheless, during field observations congestion was observed to be a problem. The congestion stemmed from motorists waiting for passengers in areas other than marked spaces, which illustrates that may people picking up passengers prefer to queue rather than pull into a parking space. This problem is particularly acute in the curved lane immediately adjacent to the crosswalk closest to the station entrance (Figure 33). Congestion in this spot is particularly problematic as it can back up to the entrance of the Kiss & Ride lot.

Figure 31: Kiss & Ride Operations




*Source: Google Earth (aerial)*

Figure 32: Surplus Kiss & Ride Parking Capacity during the Afternoon Peak Period

Figure 33: Kiss & Ride Queuing at the Bus Loop Crosswalk

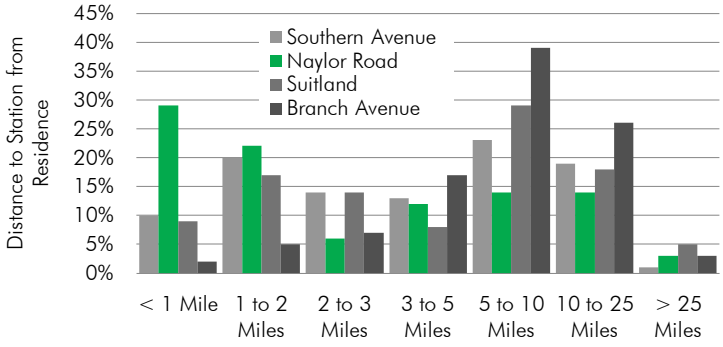
## Park & Ride

Naylor Road Station's Park & Ride capacity is relatively small compared to other southern Green Line stations in Prince George's County (Table 10). The station's sole Park & Ride surface lot southwest of the station entrance has a total of 368 parking spaces, which includes eight handicap spaces. Parking costs $4.50 per day, though Metrorail customers may reserve a space for $65 per month in addition to the daily rate.

Table 10: Southern Green Line Park & Ride SmarTrip Data (10/2011)

| Station | Park & Ride Spaces | Total Park & Ride Transactions | Transactions to Registered SmarTrip Cards | Percent Registered |
|---|---|---|---|---|
| Southern Avenue | 1,980 | 1,630 | 1,305 | 80% |
| Naylor Road | 368 | 379 | 302 | 80% |
| Suitland | 1,890 | 1,634 | 1,345 | 82% |
| Branch Avenue | 3,072 | 3,067 | 2,518 | 82% |
| Total | 7,310 | 6,710 | 5,470 | 82% |

Figure 34: Southern Green Line Park & Ride Catchment Area (10/2011)




Demand for parking exceeds available capacity at Naylor Road Station; Metro estimates that weekday utilization of the station's Park & Ride lot averages 108 percent (only 80 percent of Naylor Road Park & Ride transactions are attributable to registered SmarTrip cards, with additional transactions from non-registered cards) and often reaches capacity by 8:00 AM or earlier. A percentage greater than 100 percent indicates parking turnover during the day and that some motorists used private parking at Legend Nightclub across Naylor Road, which is now closed. Additional off-site parking near the station remains limited.

Figure 34 summarizes the Park & Ride catchment area of southern Green Line stations using data from registered SmarTrip cards. Most of Naylor Road Station's Park & Ride customers drive relatively short distances compared to other southern Green Line stations. About 57 percent of registered SmarTrip card customers using the Park & Ride drive three miles or less. For some people, this is a reasonable distance for cycling and, if less than 1/2 mile, walking. Almost 20 percent of registered SmarTrip cardholders who utilize Naylor Road Station's Park & Ride drive distances in excess of 10 miles, with some driving beyond 25 miles. Figure 34 shows that Park & Ride customers at other southern Green Line stations tend to travel longer distances to the station, particularly those who use Branch Avenue Station.

## Station Capacity & Emergency Egress

Naylor Road Station has an elevated, center platform situated above a ground-level mezzanine with a single entrance between the bus bays and Park & Ride lot. Faregates and vending machines are located in the mezzanine, with a single exitfare machine located inside the paid portion of the mezzanine (Table 11). One elevator and two escalator/stairway pairs provide access between the mezzanine and the station platform.

Table 11: Naylor Road Station Elements

| Facility | Quantity |
|---|---|
| Entrances | 1 |
| Faregates | 4 |
| Farecard Machines | 7 |
| Exitfare Machines | 1 |
| Elevators | 1 |
| Escalators | 2 |
| Stairways | 2 |

Table 12: Existing Passenger Circulation Facilities

| Element | Required | Existing |
|---|---|---|
| Platform Escalators | 2 | 2 |
| Platform Elevators* | 2 | 1 |
| Faregate Aisles | 2 | 4 |
| Farecard Vendors | 1 | 7 |

** While only one platform elevator per mezzanine is required for ADA compliance, current practice by Metro is to provide two platform elevators per mezzanine.*

Table 13: 2012 Emergency Egress

| Measure (minutes) | NFPA Standard | Morning Peak | Afternoon Peak |
|---|---|---|---|
| Time to clear platform | 4.0 | 3.6 | 5.2 |
| Time to point of safety | 6.0 | 5.1 | 6.7 |

The number of faregates at Naylor Road Station exceeds the number of required faregates based on observed ridership (see Table 12). However, faregate queuing is still commonplace during peak periods based on observations, suggesting additional faregates are needed to decrease entrance and exit times. Two stairways, each of which is paired with an escalator, provide vertical capacity beyond the available capacity of the two escalators. The station falls short of elevator redundancy, as two per platform are required per current Metro practice.

The station partially meets emergency egress standards set by the National Fire Protection Association (NFPA) *Standard for Fixed Guideway Transit and Passenger Rail Systems 2007* (NFPA 130), which requires that in an emergency situation the platform can be cleared of passengers within four minutes and that all passengers can reach a point of safety within six minutes. Evacuation time analysis is based on a worst-case-scenario with peak-direction trains containing twice the typical number of passengers to simulate a missed headway. Metro uses these guidelines as design goals, not requirements, when modifying station facilities to increase their emergency safety capabilities.

Table 13 shows that all passengers in the afternoon peak cannot clear the station platform and reach a point of safety—in this case, ground level beyond the mezzanine entrance—within the NFPA standard. However, emergency egress standards are met during the morning peak.

Figure 35: Naylor Road Station Elements

## Strengths, Weaknesses, Opportunities, and Threats

The Naylor Road Strength, Weakness, Opportunities, and Threat (SWOT) analysis summarizes the most significant findings from the existing conditions survey conducted as part of this survey. Through the SWOT analysis, the study team determined that, although small in stature, the station area provides an abundance of strengths and opportunities. Table 14 summarizes the SWOT analysis findings.

The strengths and opportunities that make Naylor Road Station ripe for renewed development are primarily based on its proximity to Washington, DC and activity centers in Prince George's County, excellent connectivity via rail (three stops to Anacostia, six stops to L'Enfant) and bus (served by eight lines) service, and on a groundswell of planning focus on development of Naylor Road and the other stations of the outer Green Line. Most of the weaknesses identified center on degraded infrastructure that has suffered from lack of investment in prior years.

The landscape for Naylor Road is shifting in a direction that promises to covert several of its weaknesses into strengths. Due to the work already done through the SHA Streetscape Project and the *Metro Green Line Corridor Action Plan*, among other efforts, the opportunity is present for funding and commitment on the local, regional, and state levels for infrastructure improvements around the station and high-value TOD.

Table 14: Results of the Naylor Road Station SWOT Analysis

| Strengths (S) | Weakness (W) | Opportunities (O) | Threats (T) |
|---|---|---|---|
| • Metro service<br>• Proximity to the District of Columbia<br>• Bus service<br>• State of MD priority TOD site<br>• Accessibility and visibility<br>• Plans for building the trail network<br>• Oxon Run Stream Valley Park<br>• Hillcrest Heights Community Center | • Poor pedestrian access<br>• No dedicated bike access/bike lanes/bike share<br>• Poor sidewalk (infrastructure) conditions<br>• Lack of continuous ADA facilities along Branch Avenue<br>• Lack of pedestrian signals and refuse areas<br>• Limited parking capacity<br>• Poor signage | • Funding for infrastructure improvements<br>• Redevelopment of Core Area<br>• Adjacent underutilized land<br>• Opportunities for mixed-use development<br>• New access points into station<br>• New signage theme and wayfinding plan | • No street lights<br>• Aging (blighted) retail |

# Future Station Area Characteristics

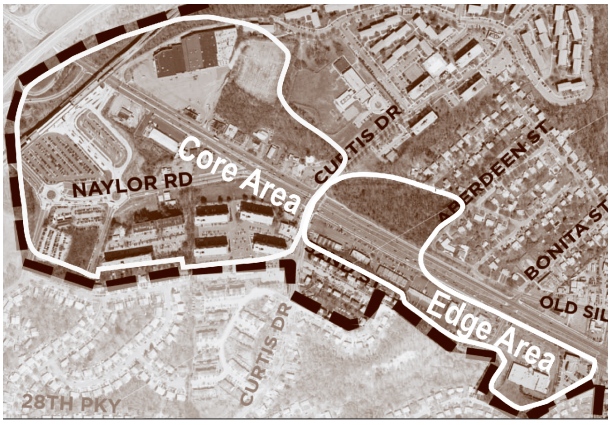
## Land Use

The Naylor Road Station area and the Hillcrest Heights community are on the verge of revitalization and redevelopment that will define a sense of place. This vision was established by the Branch Avenue Corridor Sector Plan, which identified Naylor Road Station as a Regional Center—a mixed-use regional destination to be comprised of commercial, retail, office, and/or institutional development—as a result of its high degree of transit accessibility. This plan proposes the complete redevelopment of the Naylor Road Station, as well as a significant

Figure 36: Vision for Naylor Road Station Area and Branch Avenue

*Source: Branch Avenue Corridor Sector Plan*

Figure 37: Core and Edge Areas Surrounding Naylor Road Station




*Source: Branch Avenue Corridor Sector Plan*

portion of properties along Naylor Road and Branch Avenue, by transforming the area from an automobile-oriented zone to a high-density, pedestrian-friendly district, as shown in Figure 36.

The Sector Plan envisions a Naylor Road Station that strengthens the existing community and attracts new residents, retail, and employment through increased pedestrian and bicycle connectivity, more pleasant streetscapes, improved vehicular circulation, new parks, and updated design principles to promote community safety. This vision is supported by updated design guidelines that address building setbacks, the streetscape, building height, lighting, and other considerations. High-density development will be focused north of Curtis Drive. While only a conceptual development plan for the station area has been defined (Figure 36), the plan's strategies for the Naylor Road Station "core" area (Figure 37) include development ranging from four to 12 stories, continuous ground floor retail, eight- to 20-foot sidewalks, a plaza at the Naylor Road and Branch Avenue intersection, and a ban on "big box" retail. "Edge" areas outside of the redevelopment cores would require lower-density residential uses with fewer dwellings per acre and smaller floor-to-area ratios (FAR). Table 15 highlights the differences between core and edge areas by distribution of proposed land uses.

Further planning for this and the other southern Prince George's County Green Line stations is currently underway with the *Metro Green Line Corridor Action Plan*, which will define a similar transit-oriented and walkable vision for Naylor Road Station and Southern Avenue, Suitland, and Branch Avenue Stations.

## Joint Development

Prince George's County has been trying to attract development around its Metrorail stations for years, and efforts have recently intensified. The County Executive Office designated the Naylor Road Station area as a priority for redevelopment. Subsequently, the State of Maryland designated Naylor Road as a priority TOD site and design work for streetscape and pedestrian improvements are on-going. The State's designation came as a result of the 2008 "TOD Law" that defines TOD as a "transportation purpose," meaning MDOT property, personnel, and funds, as well as other tools and support mechanisms, may be authorized to support TOD projects throughout the state.

TOD is characterized by a mix of uses within a ½ mile (10-minute) walking distance of a transit station. Building pedestrian friendly neighborhoods around transit stations provides large numbers of people with easy access to the transit system as well as connections with other modes public transportation.

Metro has a very active public/private Joint Development Program, which is a creative program through which property interests owned and/or controlled by Metro are marketed to private

developers with the objective of developing TOD. Metro aggressively seeks partners to develop Metro-owned or controlled property in order to achieve the following goals:

- Promote TOD by giving priority to joint development proposals that contain the following smart growth strategies:
  - Reduce automobile dependency;
  - Increase pedestrian/bicycle-originated transit trips;
  - Foster safe station areas;
  - Enhance surrounding area connections to transit stations, including bus access;
  - Provide mixed-use development with housing in compliance with local regulations; and
  - Offer the opportunity to obtain goods and services and enjoy active public spaces near transit stations.

- Attract new riders to the transit system by fostering commercial and residential development projects on Metro-owned or controlled land and on private properties adjacent to Metro stations.

- Create a source of revenue for the Authority to maintain the transit system by expediently negotiating joint development agreements between Metro and public or private development entities.

- Assist Metro local area jurisdictions in recapturing a portion of their past financial contributions and continuing to make subsidy payments by augmenting the local property tax base, as well as other local revenue.

The development of these cohesive neighborhoods not only supports transit but illustrates how transit can support land-use planning. The design, configuration, diversity, and intensity of uses emphasize a pedestrian-oriented environment and makes transit use more convenient. These neighborhoods ideally include retail, office, open space, and community uses, and provide residents with a sense of place. Joint development supports these goals by providing a focal point for residential, retail, and employment growth within existing urban service areas. The provision of high frequency rail and bus transit at Metro stations helps to relieve congestion on local roadways. In short, joint development is a business approach to public transportation, incorporating real estate development to generate revenue, and provide benefits to transit system users.

At Naylor Road Station, such a project may require the assembly of additional properties in the area between Naylor Road, Branch Avenue, and the Metrorail tracks (Figure 38). This 10.7-acre triangular piece of land includes station property owned by Metro and commercial buildings with various property owners. The Branch Avenue Sector Plan identified this area for redevelopment. Redevelopment opportunities for small-scale office and retail can be found near this station that serves the local single- and multifamily residential community nearby. Appropriate zoning and

Table 15: Core and Edge Area Land Use Distribution

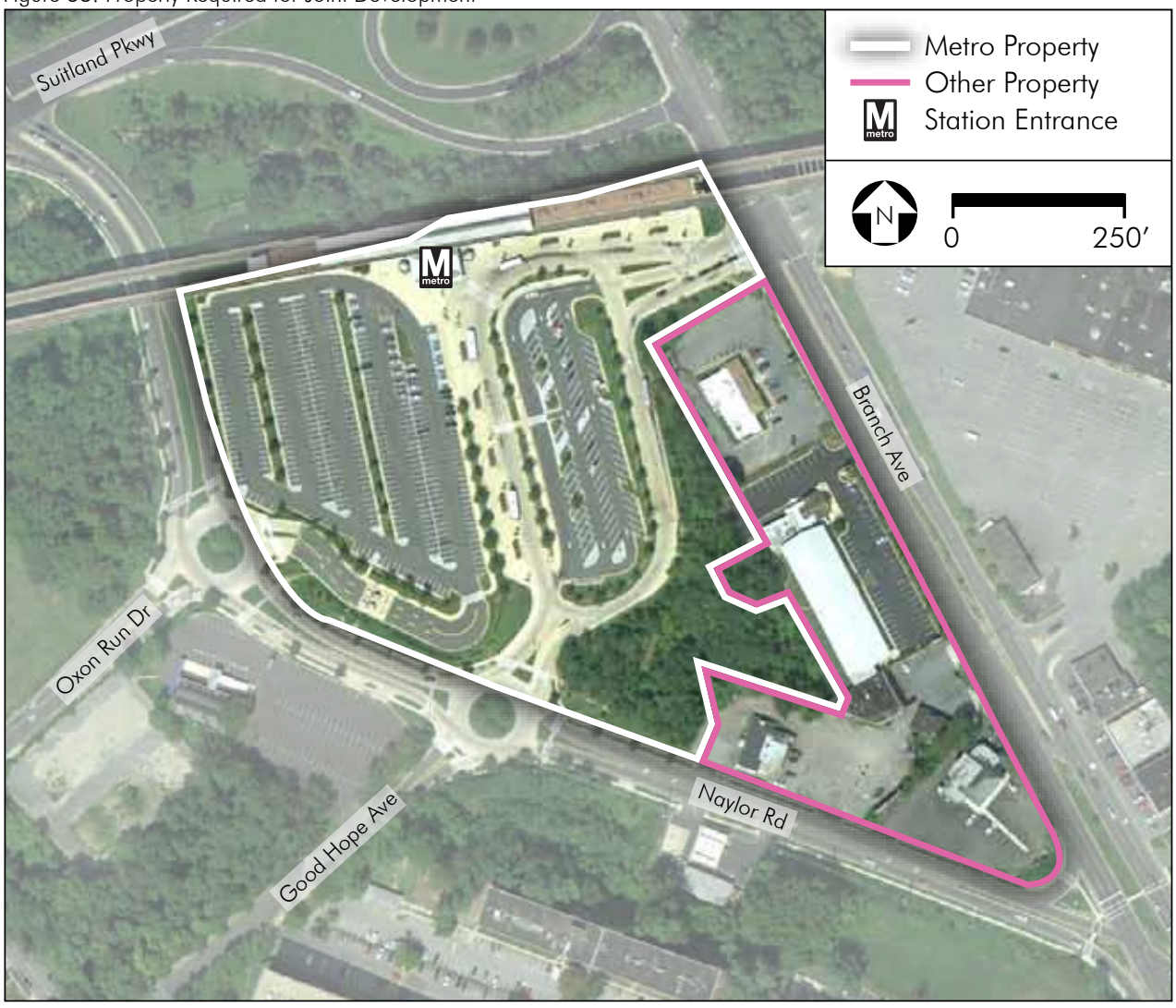
| | Requested Distribution | |
|---|---|---|
| Proposed Land Use Type | Core Areas | Edge Areas |
| Residential | 20% to 60% | 40% to 70% |
| Retail and services | 10% to 40% | 10% to 40% |
| Office | 20% to 60% | 10% to 40% |
| Public/quasi-public uses | 10% to 20% | 10% to 20% |

*Source: Branch Avenue Corridor Sector Plan*

guidelines are in place to encourage well-designed development, as evidenced by the mixed-use, pedestrian-friendly vision for the station area shown in Figure 36.

The Branch Avenue Corridor Sector Plan's residential market analysis, which used Census and other economic data ranging from 1990 to 2006, concluded that the corridor "can support more owner-occupied condominiums and townhome development, with most residential redevelopment opportunities existing at Naylor Road Station." The analysis concluded that the retail market is underserved and that "the primary market area with its household income could support full-service grocers, full-service drug stores, sit-down restaurants, a mid-size furniture store, a mid-sized sporting goods store, miscellaneous store retailers, and general merchandisers

Figure 38: Property Required for Joint Development

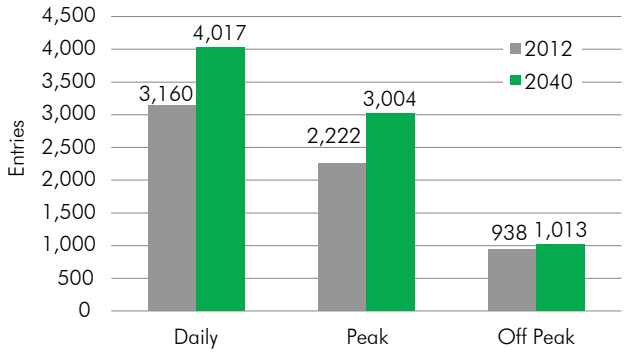



*Source: Google Earth (aerial)*

over the next ten years." In addition, "the corridor could support modest additional growth for neighborhood-servicing offices as the trade area population and income continue to grow." The Branch Avenue Corridor Sector Plan was published in September 2008.

Parking should be carefully managed at the redeveloped site. The goal is to limit the number of parking spaces and encourage shared parking between different land uses that need it at different times of day or at different times of the week. Offices, for example, typically need parking during weekdays, while retail and entertainment venues more likely need it evenings or on weekends.

Figure 39: Estimated Growth in Passenger Entries at Naylor Road Station




*Source: MWCOG travel demand model*

## Ridership

The study team used the MWCOG travel demand model, updated for the Purple Line project to meet Federal Transit Administration (FTA) requirements, to estimate Metrorail ridership and mode share at Naylor Road Station in 2040. An advantage of using the travel demand model to estimate future growth is that it accounts for the change in person trip patterns from demographic change and it accounts for effects of constrained parking on station demand.

The estimates are based on year 2040 of the Round 8.0 of the Cooperative Forecasts. The forecasts for Naylor Road Station area show an overall population increase of two percent and an employment increase of 23 percent, reflecting the expected redevelopment of the station area into an office and commercial regional center (Table 16). As shown in Figure 39, the model

Table 16: 2010 to 2040 Population and Employment Growth

| TAZ* | Jurisdiction | 2010 | | | 2040 | | | 2010 to 2040 Change | | | 2010 to 2040 Percent Change | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Household | Population | Employment | Household | Population | Employment | Household | Population | Employment | Household | Population | Employment |
| 301 | DC | 2,240 | 5,297 | 544 | 2,637 | 6,135 | 577 | 397 | 838 | 33 | 18% | 16% | 6% |
| 302 | DC | 1,127 | 2,095 | 68 | 1,172 | 2,179 | 70 | 45 | 84 | 2 | 4% | 4% | 3% |
| District Total | | 3,367 | 7,392 | 612 | 3,809 | 8,314 | 647 | 442 | 922 | 35 | 13% | 12% | 6% |
| 751 | MD | 683 | 1,648 | 3,608 | 664 | 1,575 | 4,244 | -19 | -73 | 636 | 1% | -3% | 25% |
| 757 | MD | 1,817 | 4,526 | 1,146 | 1,814 | 4,369 | 1,272 | -3 | -157 | 126 | 0% | -3% | 11% |
| 769 | MD | 1,232 | 3,201 | 1,219 | 1,246 | 3,098 | 1,426 | 14 | -103 | 207 | 1% | -3% | 17% |
| 770 | MD | 2,097 | 5,112 | 95 | 2,080 | 4,931 | 602 | -17 | -181 | 507 | -1% | -4% | 534% |
| Maryland Total | | 5,829 | 14,487 | 6,068 | 5,804 | 13,973 | 7,544 | -25 | -514 | 1,476 | 0% | -4% | 24% |
| Naylor Road Total | | 9,196 | 21,879 | 6,680 | 9,613 | 22,287 | 8,191 | 417 | 408 | 1,511 | 5% | 2% | 23% |

*Source: MWCOG Round 8.0 Cooperative Forecasts*

**TAZ identification numbers correspond to the 2,191-TAZ regional division*

estimates a 35-percent increase in peak period Metrorail entries and an eight-percent increase in off-peak entries between 2012 and 2040, resulting in a total daily increase of 27 percent. Most of the growth in Naylor Road Station entries is concentrated in the peak period. This is consistent with the redevelopment vision for the station area that emphasizes high-density office in the immediate Naylor Road Station area, which will increase peak-period commuting.

## Station Access

With the transformation of the Naylor Road Station area from an automobile-oriented transit center to a regional center of mixed-use TOD, how people access the station will change by 2040. The travel demand model results, shown in Table 17, are expressed as percent changes in mode share from 2012 to 2040. The model estimated mode share changes for the peak and off-peak periods; when combined these periods account for a typical weekday. Results are shown for these three periods—peak periods, off-peak periods, and all day—to provide a clearer picture of how ridership is estimated to change. The last two rows of Table 17 show the before-and-after snapshot of weekday station access.

As would be expected from a wholesale land use transformation that emphasizes walking and cycling, the model estimated that nonmotorized access will grow significantly by 2040, owing to the expected concentration of employment and retail adjacent to the station entrance as well proximity to new high-density residential along Branch Avenue and Naylor Road. The model did not separate walking and bicycle trips, but pedestrians will likely comprise the vast majority of these trips as Metro's bicycle access target for Naylor Road Station is one percent.

The model estimated a decline in automobile access as a percent of daily mode share, particularly Kiss & Ride access. This is likely due to the changing demographics of station area TAZs, a key input into the model. The model results are consistent with the likely future for Naylor Road Station based on previous studies. As a result of a future joint development, the existing Park & Ride lot could be removed or consolidated into a multi-level garage. Similarly, the Kiss & Ride function will need to be incorporated into the new development.

The model's initial results showed flat or negative bus ridership growth to the station. However, the purpose of this study is to ensure adequate future access capacity for all modes, and as such a conservative approach would be to plan for some increase in bus access facility needs. To ensure that adequate bus capacity is considered, this study assumes bus ridership to Naylor Road Station will grow similarly to the station's Metrorail entries (35 percent during peak periods and eight percent during off-peak periods). As residential densities increase near the station and along Branch Avenue, bus ridership can be expected to similarly increase.

This study also included a separate analysis to estimate future access needs for private shuttles (i.e. non-Metro and non-county services that typically serve offices, apartments, hospitals,

Table 17: 2040 Estimated Weekday Mode Share for Naylor Road Station

| Period | Park & Ride | Kiss & Ride | Bus | Walk/ Bike | Total |
|---|---|---|---|---|---|
| Weekday Mode Share Change from 2012 to 2040* | | | | | |
| Peak Periods | -3% | -49% | 35% | 39% | 35% |
| Off-Peak Periods | 167% | -75% | 8% | 294% | 8% |
| All day | 12% | -56% | 30% | 92% | 27% |
| Weekday Mode Share | | | | | |
| 2012 | 23% | 12% | 46% | 19% | 100% |
| 2040 | 20% | 4% | 47% | 29% | 100% |

** Rounded to the nearest whole number*

educational centers, auto dealers, and hotels). The shuttle analysis methodology, developed initially for Metro's *Shuttle Services at Metro Facilities* study, is based on the premise that factors contributing to the decision to offer shuttle services will continue into the future and that the number of shuttle trips to any particular Metrorail station is reasonably related to demographic variables in the surrounding area. Put more simply, estimating future shuttle trips is a function of how many shuttles exist at the station now and how land use, households, and employment around the station will change by 2040.

Employing this methodology was not feasible for Naylor Road Station because no shuttles currently serve it. Therefore, future shuttle trips to the station were estimated using relationships between shuttles, distance from Metrorail stations, and household and employment densities throughout the Washington region, as observed during the development of the *Shuttle Services at Metro Facilities* study. More detail on these relationships is provided in the Appendix. Planning for up to three shuttle trips per hour during peak periods in 2040 is a reasonable, conservative assumption given the available data.

## Traffic

The SHA Streetscape Project plans to physically transform Branch Avenue and Naylor into urban boulevards to support TOD and multimodal mobility in the Naylor Road Station area and farther south along Branch Avenue, as envisioned in the Branch Avenue Corridor Sector Plan. A key study goal is to calm speeding, weaving, and congestion on Branch Avenue and Naylor Road while maintaining capacity. The plan recommends a 120- to 150-foot right-of-way for Branch Avenue and a 120-foot right-of-way for Naylor Road. The additional ROW will accommodate streetscape elements such as on-street bicycle lanes, wider sidewalks, high visibility crosswalks, pedestrian refuges, driveway consolidation, driveway apron crossings, sidewalk bump-outs, on-street parking, pedestrian signals, retimed traffic signals, and roadway restriping and resurfacing. Proposed pedestrian and bicycle improvements to these roadways will be paired with traffic calming measures to make these commuter roadways accessible to all users, slow down drivers, and improve safety for everyone. The proposed roadway designs, shown in Figure 40, are inspired by the Branch Avenue Corridor Sector Plan. Construction is anticipated to begin in 2014, though a funding source has not been identified.

Figure 40: Current Concept for Branch Avenue (left) and Naylor Road (right)

*Source: MD 5 (Branch Avenue) and MD 637 (Naylor Road) Streetscape Improvements*

# Future Station Access Needs

The Naylor Road Station area is expected to undergo a wholesale transformation from an auto-centric transit station to a mixed-use, transit-oriented regional center with high-density housing, offices, and retail. Realizing this vision will take years, and this redevelopment process is just now beginning through completed or in-process planning studies tasked with improving the station area and its multimodal access. This report uses information and findings from these studies as well as additional station observations and analyses to define station access deficiencies and opportunities for improvement—or more simply, station access "needs." Needs highlighted in this section are grouped by mode of access. The next section, *Station Recommendations*, summarizes recommendations proposed in response to these defined needs.

## Pedestrian

Twenty-nine percent more pedestrians and cyclists are estimated to access Naylor Road Station by 2040 compared to 2012, with pedestrians making up almost all of the increase. Comprehensive redevelopment of the station area would significantly contribute to this increase in walking trips. TOD near the station is planned to greatly improve the pedestrian experience through the use of complete street and placemaking principles. Until then, the station area remains automobile-oriented and in some cases inhospitable to pedestrians. Pedestrian infrastructure within and surrounding the Naylor Road Station area is lacking in many, but not all, respects, and it will need to be improved to not only facilitate the anticipated increase in pedestrians by 2040 but also accommodate the many pedestrians who access the station now. The following pedestrian needs result from the existing station area configuration.

### Desired Access Points

Despite its large footprint, pedestrian access to Naylor Road Station is limited as much of the automobile-oriented station area is protected by a fence capped with barbed wire. Pedestrians have created impromptu access points to reach the station entrance more quickly or to save time when walking to nearby locations. Impromptu access points are located along pedestrian desire lines and are characterized by worn, dirt pathways where from frequent use.

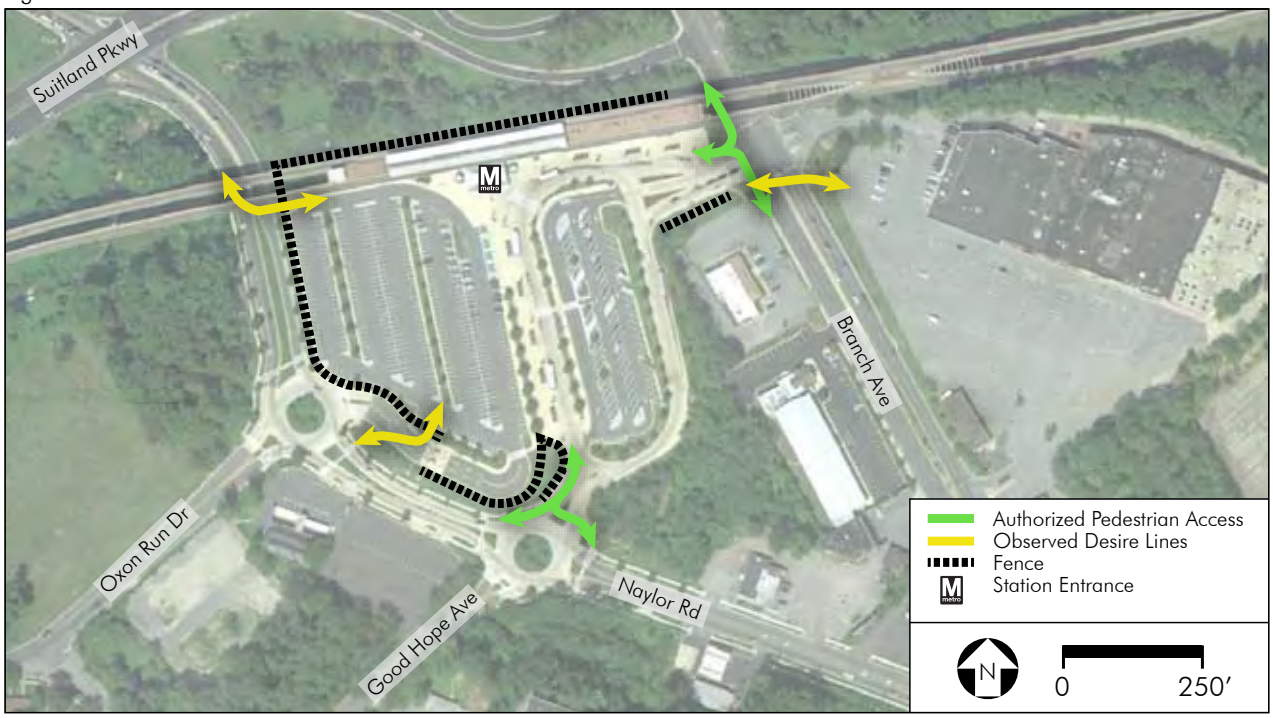
Figure 41 highlights the location of three observed desire lines: the northwest corner of the Park & Ride lot, the Oxon Run Drive station entrance, and the Branch Avenue station entrance. Worn pathways are important indicators of where the pedestrian infrastructure is not meeting the needs of the walking public, and where targeted improvements are likely to have a positive impact.

### Safe Pedestrian Crossings

Figure 17, shown previously in *Existing Station Area Characteristics*, shows pedestrian crossing issues that are in need of improvement. Crosswalks and pedestrian signals are missing at several intersections where pedestrians frequently travel. Signal cycles along Branch Avenue are long

due to heavy vehicle traffic, inconveniencing pedestrians. Some pedestrians cross Branch Avenue at dangerous midblock locations to avoid waiting; midblock crossings are also the result of the station area's superblock street network, which provides minimal safe crossing opportunities. Several study-area intersections have large turning radii, which allow motorists to turn at high speeds.

Figure 41: Pedestrian Access Issues




*Source: Google Earth (aerial)*

Figure 42: Narrow Sidewalks on Branch Avenue between Suitland Parkway and Naylor Road

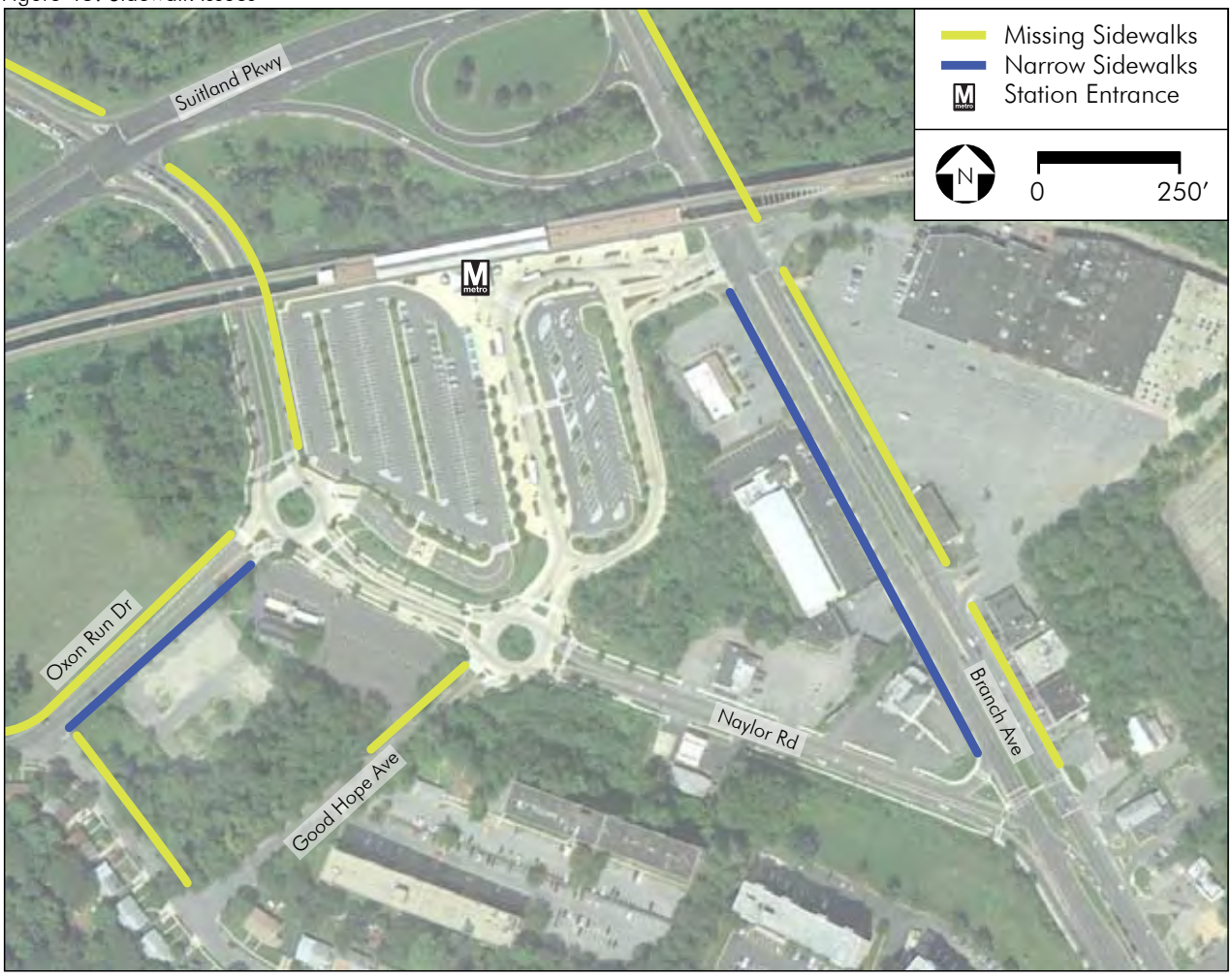
## Comprehensive Sidewalk Coverage

Large gaps exist in sidewalk coverage near Naylor Road Station. As shown in Figure 43, Branch Avenue, Naylor Road, and Oxon Run Drive—the most direct pedestrian routes to and from the station—are missing sidewalks. The sidewalk on the west side of Branch Avenue is narrow and lacks a vegetated buffer between it and the busy street, resulting in an uncomfortable pedestrian environment. The sidewalk on Oxon Run Drive is narrow as well.

## Wayfinding Signage

Wayfinding signage is limited for pedestrians and cyclists. As the station area and Branch Avenue corridor are redeveloped into mixed-use communities, more visitors and daytime office workers who are not as familiar with the area as residents will use Naylor Road Station. Wayfinding signage is needed to direct these pedestrians along efficient and safe pathways to and from the station.

Figure 43: Sidewalk Issues




*Source: Google Earth (aerial)*

Table 18: Estimated Bicycle Parking Needed by 2040

| Bicycle Parking Spaces | | | |
|---|---|---|---|
| Existing* | Needed | Difference | Growth |
| 24 | 32 | 8 | 33.3% |

** Assumes two spaces per rack and one space per locker*

Figure 44: Example Bicycle Wayfinding Sign

*Source: Erica M. (Creative Commons)*

## Bicycle

Metro is encouraging bicycle access to Metrorail stations with targeted improvements, demonstration projects, and updated policies and goals, including a systemwide average bicycle mode share goal of 3.5 percent of passengers arriving in the morning peak by 2030. As this systemwide goal is an average across all stations, some stations will have higher or lower goals based on existing ridership. The bicycle mode share goal for Naylor Road Station, for example, is one percent, or 32 cyclists in the morning peak based on Metro's projections. Achieving this goal will require Metro and local jurisdictions to address the following needs.

### Bicycle Connectivity to Surrounding Communities

No bicycle lanes or designated pathways connect the surrounding communities to Naylor Road Station, and both Naylor Road and Branch Avenue are challenging for cyclists due to narrow lanes and heavy traffic volumes. A lack of such bicycle facilities, as well as the busy primary roadways surrounding the station area, likely contributes to the low number of cyclists accessing the station. Direct bicycle facilities are needed to safely and comfortably guide cyclists of all abilities to the station.

### Additional Bicycle Parking

Metro's goal is to increase bicycle mode share of all customers accessing the station. Metro estimates that Naylor Road Station will need 32 total bicycle parking spaces to meet this goal by 2030, an increase of 33 percent beyond present bicycle parking capacity (Table 18).

### Wayfinding Signage

Wayfinding signage is limited for pedestrians and cyclists. As bicycle lanes and shared-use trails are implemented in the following years, wayfinding signage is needed to direct cyclists along safe paths to Naylor Road Station.

## Bus

This study assumes a 35-percent increase in peak-period bus boardings at Naylor Road Station by 2040. When this assumption is applied on a line-by-line basis for all routes serving Naylor Road station, the overall level of service increases from 25 to 33 buses per hour in the peak periods. This increase in Naylor Road Station bus activity, when measured against bus dwell times at Naylor Road, results in an increase in the total number of needed bays from six to seven, still below the existing eight bays (Table 19). Thus, future bus service increases assumed in this study will not necessitate additional bus bay capacity beyond what is currently available. However, present and future conditions at Naylor Road Station present some opportunities to improve bus operations.

## Bus Stop Access and Amenities

Some bus stops near Naylor Road Station lack passenger amenities and lack adequate access for disabled passengers. Metro's *Guidelines: Design and Placement of Transit Stops* defines the type of amenities suggested for each of three bus stops types (basic stop, enhanced service bus stop, and transit center). Bus stops near Naylor Road Station are classified as basic stops. The guidelines suggest the following elements for basic stops: a bus stop sign, a 5' x 8' concrete pad that complies with the Americans with Disabilities Act of 1990 Accessibility Guidelines (ADAAG), an adjacent four-foot-wide sidewalk, an information case that contains a detailed schedule, and a NextBus phone number sign for up-to-date arrival information. Basic stops with higher ridership qualify for shelters and benches at 50 or more boardings per day, while lighting is only needed at stops with evening service. Prince George's County has established standards for bus stop amenities as well. For example, shelters are suggested for stops that exceed 100 boardings per day or 20 boardings per hour, are located within 1/4-mile from a major trip generator, and serves two or more bus routes. Prince George's County's bus stop guidelines state that stops should be located within 100 feet of curb cuts to allow access by disabled passengers.

Table 19: Estimated Bus Bay Needs in 2012 & 2040

| Bus Lines Serving Naylor Road Station | 2012 | | 2040 | |
|---|---|---|---|---|
| | Peak Hour Buses/Hour | Bus Bays Required | Peak Hour Buses/Hour | Bus Bays Required |
| M2 | 3 | 0.4 | 4 | 0.5 |
| F14 | 2 | 0.3 | 3 | 0.5 |
| H11/12/13 | 4 | 0.7 | 5 | 0.9 |
| C12/C14 | 2.4 | 0.4 | 3 | 0.5 |
| 36 | 4 | 0.9 | 5 | 1.2 |
| 39 | 4 | 0.3 | 5 | 0.4 |
| 34 | 4 | 0.7 | 5 | 0.8 |
| TB32 | 2 | 0.4 | 3 | 0.7 |
| Total | 25 | 6.0 | 33 | 7.0 |

## Bus Delay at Naylor Road Roundabouts

Bus drivers have complained that the Naylor Road roundabouts do not provide adequate gaps in traffic during peak periods. Roundabouts are only controlled by yield signs and not traffic signals. As most vehicles travel through these roundabouts on Naylor Road during peak periods, opportunities to turn onto Naylor Road from the bus bay access point or Oxon Run Drive during the busiest times are limited.

## Separate Bus Bay and Kiss & Ride Access Points

Naylor Road Station was designed with shared access to the bus bays and Kiss & Ride parking lot, as shown previously in Figure 31. Buses and automobiles, particularly when accessing the station area from Naylor Road, share roadway space, introducing conflicting travel patterns between the modes and potentially delaying buses trying to exit the station. Metro's *Station Site and Access Planning Manual* states that separate modes should be provided if feasible. The manual further states that "bus traffic should be separate from automobile traffic wherever possible." Expected redevelopment of the Naylor Road Station area will provide an opportunity to redesign these facilities and separate their entrances and exits.

Figure 45: Combined Bus Bay and Kiss & Ride Access Point

## Shuttles

No private shuttle services access Naylor Road Station. This study estimates between three to five shuttles may serve the station by 2040 based on expected changes in population and employment density in the surrounding communities. Private shuttles can provide a vital service for Metrorail passengers and should be accommodated where possible.

Guidelines in Metro's *Station Site and Access Planning Manual* recommend one curbside shuttle space for every 10 vehicle parking spaces in a station Kiss & Ride. The Naylor Road Kiss & Ride lot provides no dedicated space for shuttle services as currently configured. Despite relatively low future shuttle utilization compared to other Metrorail stations, small shuttle services need dedicated space to improve Kiss & Ride operations and formalize their presence. Conversely, large shuttles are better served by station bus bays. Shuttles that intend to use a bus bay instead of the Kiss & Ride must first apply for permission to do so from Metro.

## Kiss & Ride

### Vehicle Delay at Naylor Road Roundabout

As with bus drivers, motorists who are exiting the Kiss & Ride at the Naylor Road roundabout often have difficulty turning onto Naylor Road during peak periods. As most vehicles travel through this roundabout, opportunities to turn onto Naylor Road can be limited during the busiest times of day.

### Separate Bus Bay and Kiss & Ride Access Points

As mentioned previously, Naylor Road Station's Kiss & Ride and bus bay access points are shared. Entering the Kiss & Ride from Branch Avenue can be particularly confusing for motorists as the driveway fairly quickly diverges into two pathways, one for the bus bays and the other for the Kiss & Ride, and the proper path is not well marked. Motorists often erroneously enter the bus bay facility from this entrance, and, as a result, must make a complete loop around the Kiss & Ride to correctly enter. These shared access points create potential safety conflicts between buses and automobiles, and shared exits mean buses may be slowed by Kiss & Ride traffic.

### Kiss & Ride Congestion

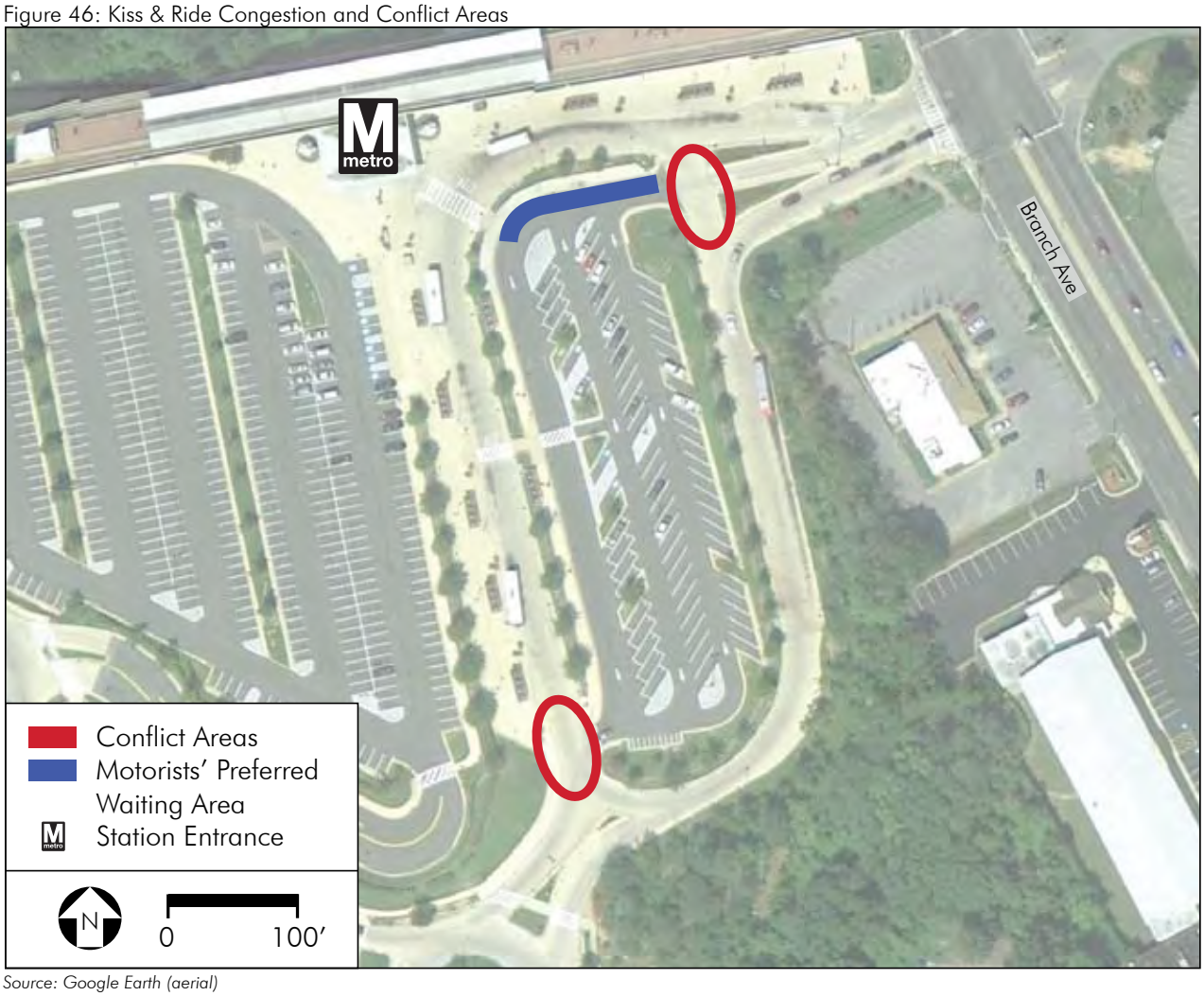
Like other Kiss & Rides in the Metrorail system, a portion of Kiss & Ride customers at Naylor Road Station do not utilize temporary parking spaces and instead prefer to wait for passengers as close to the station entrance as possible. These motorists can queue along the curb near the station entrance crosswalk. Due to the limited space along the curb, congestion in this location is problematic as vehicles can back up to the Kiss & Ride entrance, which can impact bus operations. An improvement is needed in the short-term to alleviate congestion and resulting potential bus/automobile conflicts.

Long-term improvements are needed as well, as the Naylor Road Station Kiss & Ride would likely be redesigned as part of a station area redevelopment. Station observations revealed that most of the 55 temporary parking spaces (A-spaces and metered spaces) go unused, even during the afternoon peak period. To estimate a conservative, maximum number of temporary parking spaces needed for a future Kiss & Ride facility, this study utilized Naylor Road Station's

12 percent Kiss & Ride mode share from the *2007 Metrorail Passenger Survey*. Based on station observations, which showed a parking utilization rate of approximately 17 vehicles per hour, 30 spaces will be sufficient to accommodate a 12-percent share of 2040 Naylor Road Station passengers (see the Appendix for calculation details). Station observations further revealed that the more immediate limitation of the existing Kiss & Ride is the amount of curbside pick-up space, which sometimes results in long queues. This is a Metrorail systemwide trend. Therefore, this study recommends that the future Naylor Road Station Kiss & Ride provide at least 30 temporary parking spaces, and that its design accommodates a greater amount of space for curbside queuing.

If Kiss & Ride demand proves to be lower than 12 percent, it would be advisable for any future Kiss & Ride configuration to allow for some flexibility to repurpose unneeded Kiss & Ride spaces to other uses, such as additional bicycle parking or car-sharing spaces. Future TOD

Figure 46: Kiss & Ride Congestion and Conflict Areas




*Source: Google Earth (aerial)*

plans will also need to be taken into account inasmuch as the street grid created may present other "unofficial" locations for Kiss & Ride activity to take place, such as street curbsides free of parked cars during peak hours.

## Park & Ride

Parking at Naylor Road Station is constrained. The station's single Park & Ride surface lot contains 368 daily parking spaces, which represents only five percent of all available parking on the southern Green Line (Southern Avenue Station, Naylor Road Station, Suitland Station, and Branch Avenue Station). Daily parking will very likely remain constrained into the future given the expected redevelopment of the station area into a transit-oriented regional center that emphasizes pedestrian and bicycle access.

This study utilized the MWCOG travel demand model to estimate the magnitude of 2040 parking demand by assuming Naylor Road Station parking is unconstrained. Such an analysis helps Metro understand the imbalance between parking supply and demand. The results of this analysis showed that, in an unconstrained parking scenario, daily parking demand would be reduced at both Suitland Station and Branch Avenue Station and increased for Naylor Road Station, most likely because Naylor Road Station is closer to the District and would thus save time for daily commuters. The analysis found that 2040 Park & Ride trips to Naylor Road Station would increase by 260 percent if parking were unconstrained, as shown in Table 20. If trying to meet this demand, Metro would need a Park & Ride facility of approximately 2,325 daily spaces, assuming an average occupancy rate is 1.04 people per vehicle.

Table 20: Unconstrained Parking Demand at Naylor Road Station

| | 2040 Peak Period Park & Ride Demand* | | | |
|---|---|---|---|---|
| Station | Constrained Parking Scenario | Unconstrained Parking Scenario | Total Difference | Percent Difference |
| Naylor Road | 646 | 2,325 | +1,679 | +260% |
| Suitland | 3,462 | 2,862 | -600 | -17% |
| Branch Avenue | 5,035 | 4,534 | -501 | -10% |

*Source: MWCOG travel demand model*

** These numbers represent the number of desired parking trips in 2040, not the number of parking spaces. The number of desired trips can be higher than the number of spaces due to turnover.*

Significantly increasing the amount of Park & Ride spaces at Naylor Road Station to such a degree, however, does not conform to Metro's, Prince George's County's, or Maryland's vision for the station area. The vision for a redeveloped Naylor Road Station emphasizes alternative modes of access, such as walking, cycling, and bus services, and the high capital cost of providing enough parking to meet demand throughout the Metrorail system has similarly prompted Metro to focus on promoting these modes of access, which have lower capital costs. Even the constrained scenario shows parking demand well over the existing parking capacity of Naylor Road Station, likely due to reuse of spaces and overflow parking inherent in current parking utilization data.

## Station Capacity & Emergency Egress

Infrastructure requirements were evaluated with a station capacity analysis based on 2012 and estimated 2040 ridership levels and requirements set by Metro and the *Transit Capacity and Quality of Service Manual*. This analysis established the minimum required vertical (e.g. elevators

and escalators) and horizontal (e.g. faregate aisles and farecard vendors) circulation elements. Table 21 shows that existing platform-to-mezzanine elevator capacity does not meet established standards, but that all other circulation elements at the existing mezzanine meet the minimum requirements for 2012 and estimated 2040 passenger loads.

This study also analyzed Naylor Road Station's emergency egress capacity under existing conditions as well as estimated conditions in 2040. This analysis is based on the requirements set by the NFPA 130 standards. Evacuation time analysis is based on a worst-case-scenario with peak-direction trains containing twice the typical number of passengers to simulate a missed headway. Metro uses these guidelines as design goals when modifying station facilities to increase their emergency safety capabilities. The results of this analysis are shown in Table 22.

Table 21: Station Capacity Analysis Results

| Circulation Element | Existing | Elements Required 2012 | Elements Required 2040 |
|---|---|---|---|
| Platform Escalators | 2 | 2 | 2 |
| Platform Elevators* | 1 | 2 | 2 |
| Faregate Aisles | 4 | 2 | 2 |
| Farecard Vendors | 7 | 1 | 1 |

** While only one platform elevator per mezzanine is required for ADA compliance, current practice by Metro is to provide two platform elevators per mezzanine.*

Table 22: Future Emergency Egress

| Measure (minutes) | NFPA Standard | 2012 | 2040 |
|---|---|---|---|
| Morning Peak | | | |
| Time to clear platform | 4.0 | 3.6 | 2.5 |
| Time to point of safety | 6.0 | 5.1 | 4.0 |
| Afternoon Peak | | | |
| Time to clear platform | 4.0 | 5.2 | 3.4 |
| Time to point of safety | 6.0 | 6.7 | 4.9 |

The results show that Naylor Road Station meets all emergency egress standards in 2040. Emergency egress times are shorter in 2040 than present conditions despite growing ridership. This is accomplished by increasing the number of peak-direction trains in the peak period to one train every 2.5 minutes; a peak-direction train currently arrives every 4.6 minutes on average during the peak hour. More trains with greater capacity can serve the station as the headways are reduced, reducing the number of people per train and, thus, the number of people exiting the station in an emergency situation.

## Summary

Station area needs discussed in this section are grouped by access mode and summarized in Table 23. The station area is expected to undergo a comprehensive transformation associated with TOD. Some of these needs are directly tied to or even made necessary by the redevelopment of the station and would not happen in the absence of TOD. Other needs are based on deficiencies observed in the existing station area configuration and can be addressed either as part of or before a TOD plan. For example, the need to provide seven bus bays only takes effect if the existing bus bays are to be rebuilt as part of station area redevelopment. Conversely, the need for planned and proposed bicycle lanes and paths relates to a deficiency in the existing station area conditions, and remains the same whether or not TOD is implemented at Naylor Road Station.

Table 23: Summary of Naylor Road Station Access Needs

| Need | Existing Station Area | Transit-Oriented Development |
|---|---|---|
| Pedestrian | | |
| Formalized popular desire lines | ● | |
| Wayfinding signage | ● | |
| Safer crossings at intersections and midblock locations | ● | ● |
| Comprehensive coverage of sidewalks with adequate width | ● | ● |
| Bicycle | | |
| New bicycle parking to at least meet future bicycle mode share goal | ● | |
| Planned and proposed bicycle lanes and paths | ● | |
| Wayfinding signage | ● | |
| Bus | | |
| Amenities at nearby bus stops | ● | |
| Designated drop-off space for large shuttles | ● | |
| Seven bus bays to serve growth in bus travel to Naylor Road Station | | ● |
| Routing of buses away from roundabouts | | ● |
| Separation of bus and automobile access points | | ● |
| Kiss & Ride | | |
| Designated drop-off space for small shuttles | ● | |
| Thirty short-term parking spaces (A-spaces and metered spaces) to serve future demand | | ● |
| Kiss & Ride design to discourage queue congestion | | ● |
| Separation of bus and automobile access points | | ● |
| Park & Ride | | |
| Replacement of 368 daily parking spaces | | ● |

# Station Recommendations

Station access recommendations were developed in response to station needs. Like the needs identified in the previous section, Naylor Road Station access recommendations are divided into two general categories:

- Recommendations based on deficiencies observed in the existing station area configuration that can be addressed either as part of or before TOD implementation, and
- TOD-based recommendations, or those recommendations tied to and made necessary by the expected redevelopment of the station area.

Table 24: Summary of Existing Station Area Recommendations

| Location | Recommendation |
|---|---|
| Naylor Rd | Add pedestrian signals, crosswalks, and pedestrian refuge areas at Suitland Pkwy intersection |
| | Add sidewalks on east side between Suitland Pkwy and Oxon Run Dr, and on both sides north of Suitland Pkwy |
| | Add shared lane markings and "Bikes May Use Full Lane" signs north of Suitland Pkwy* |
| | Add proposed bicycle lanes and shared lane markings south of Suitland Pkwy |
| | Add proposed sidewalks and remove fence along observed pedestrian desire lines |
| | Install rapid flash beacons at roundabout crosswalks and crosswalk at the right-turn lane to Branch Ave |
| | Study additional marked crossing between Good Hope Ave and Branch Ave* |
| Branch Ave | Add sidewalk on east side between station entrance and Southern Ave |
| | Add proposed bicycle lanes from the District line south |
| | Add proposed pedestrian signals and crosswalks at all approaches at station entrance intersection |
| | Add pedestrian refuge areas and reduce northbound right-turn radius at station entrance intersection |
| | Add proposed new and widened sidewalks south of station entrance intersection |
| | Study midblock pedestrian hybrid signal south of station entrance intersection* |
| Oxon Run Dr | Add new and widen existing sidewalks |
| | Add shared lane markings and "Bikes May Use Full Lane" signs* |
| | Add connection to proposed Oxon Run Trail |
| | Add curb extension, crosswalks, and reduce curb radii at Oxon Park St intersection |
| Good Hope Ave | Add sidewalks on west side |
| Suitland Pkwy | Implement proposed Suitland Parkway multi-use path into Maryland |
| Oxon Run Park | Implement proposed Oxon Run Trail |
| Station Footprint: Bike & Pedestrian | Add pathway from Oxon Run Dr through Park & Ride lot to station entrance |
| | Add at least 10 bicycle parking spaces |
| Bus Bays | Require bus drivers to leave Bay C after discharging passengers |
| | Require operators of large shuttles to apply for a station access permit** |
| Kiss & Ride | Improve motorist awareness of Kiss & Ride entrance at Branch Avenue |
| | Add striping and signage to encourage motorists to queue near Kiss & Ride shelters |
| | Designate space for small shuttles |
| General | Implement improved wayfinding signage |
| | Add bus stop amenities—benches, shelters, sidewalk connections, and ADA accessibility features—where missing |

** More detailed study and analysis is required to determine overall feasibility*

*** Requires adherence to Metro's shuttle bus policy, two key factors are sufficient bus bay capacity and compliance with insurance requirements.*

Specific implementation timelines are not defined in this study. However, TOD-based recommendations rely on the implementation of the mixed-use vision for the station and are therefore generally considered long-term recommendations. Existing station area recommendations, on the other hand, are not dependent upon TOD and can thus be implemented at any point in the near term or long term. Implementing many of the station area recommendations will involve coordination between Metro and various local, regional, and federal agencies, private developers, and members of the community. Recommendations are not constrained by implementation costs.

## Existing Station Area Recommendations

Existing station area recommendations, shown in Table 24, were devised in response to observed deficiencies that result from the present configuration of Naylor Road Station's facilities and the existing conditions of its surroundings. A few of these recommendations will remain relevant only until the station area is redeveloped, at which point the existing facilities will be removed and reconfigured. Most existing station area recommendations will stay relevant after station area redevelopment because the need will remain after the introduction of TOD or they address a nearby need beyond Metro property. Existing station area recommendations can be implemented independently of each other, but some recommendations may be more effective if implemented in concert.

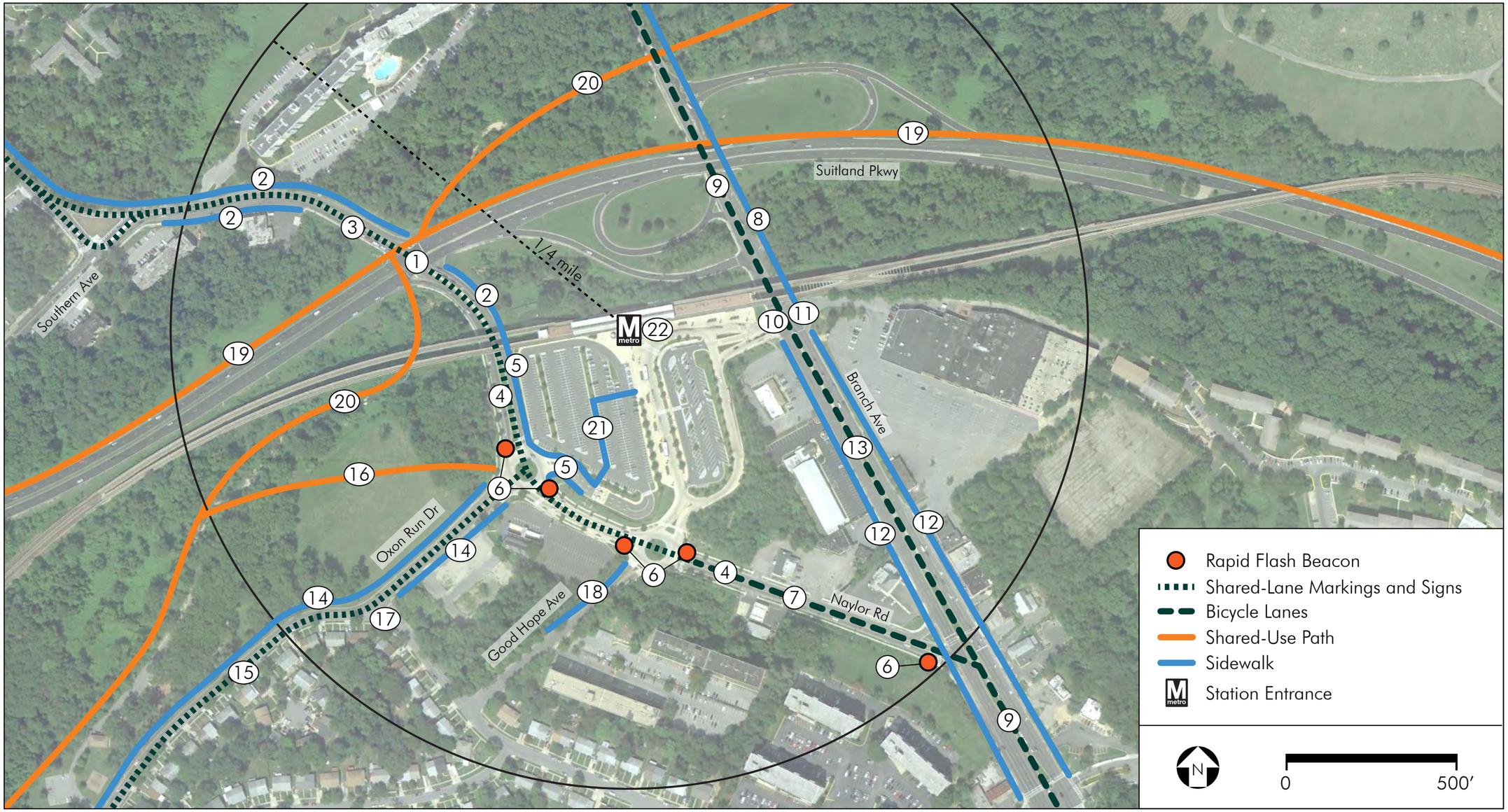
### Pedestrian and Bicycle

Improving the Naylor Road Station area's walking and cycling environment is a critical step toward realizing its mixed-use, transit-oriented vision. Many of the station area's pedestrian and bicycle deficiencies can be addressed before TOD is implemented. This study's existing station area pedestrian and bicycle recommendations (Table 25) are designed to improve safety, convenience, and accessibility. These recommendations, which are mapped in Figure 47, are the result of station observations performed during this study as well as findings presented in previously completed and ongoing station area improvement plans.

As noted in Table 25, some of these recommendations require more detailed operational and safety analyses to conclude overall feasibility. Implementing any of these recommendations will require coordination between Metro and local, regional, and federal partners, including NPS, Maryland Department of Transportation (MDOT), SHA, M-NCPPC, Prince George's County Department of Public Works and Transportation (DPW&T), and DDOT.

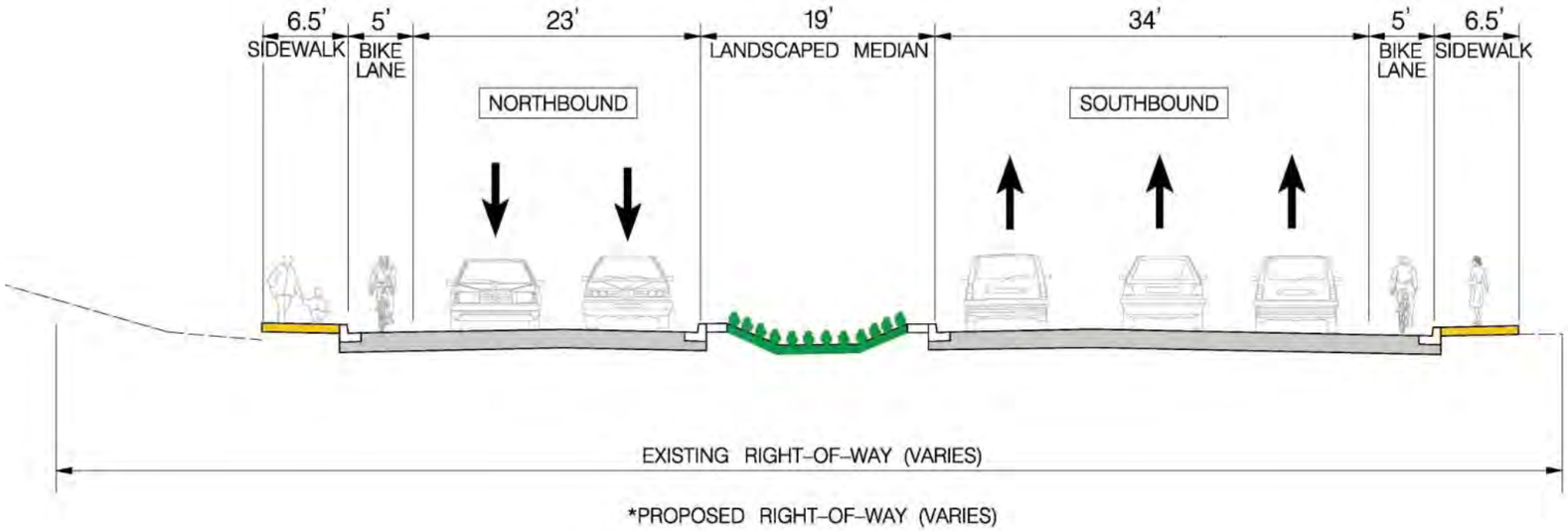
For example, recommendations 1, 2, 4, 5, 9, 10, and 12 in Table 25 highlight improvements proposed by the SHA Streetscape Project—currently in the design phase and planned to begin construction in 2014, if funding is identified—and supported by foundation laid by the Branch Avenue Corridor Sector Plan. The SHA Streetscape Project is expected to improve crossing safety, widen or add sidewalks to a 6.5- to 10-foot width, and add bicycle facilities on Naylor Road south of Suitland Parkway and on Branch Avenue south of the Naylor Road Station access point (see Figure 48 for proposed cross sections). The SHA Streetscape Project also plans to improve access along observed pedestrian desire lines with a ramp and sidewalk on Naylor Road at the northwest corner of the Park & Ride, and sidewalks on both sides of the Park & Ride entryway between the roundabout and the Park & Ride payment booths.

Figure 47: Pedestrian and Bicycle Recommendations




*Source: Google Earth (aerial)*

Figure 48: Proposed Branch Avenue (top) and Naylor Road (bottom) Typical Sections




*Source: MD 5 (Branch Avenue) and MD 637 (Naylor Road) Streetscape Improvements*

Not all recommendations will be addressed through the SHA Streetscape Project. The installation of a pedestrian hybrid signal—more commonly referred to as a HAWK (high intensity activated crosswalk) signal—at a midblock crossing on Branch Avenue is unlikely. SHA currently does not support midblock crossing signals, but it is important to note the potential need for a crossing at this location for future consideration. This study recommends that the final Naylor Road Station site plan should consider such pedestrian desire lines when locating new streets through the station area. Ideally these streets will eliminate the existing superblock pattern along Branch Avenue and provide multiple safe crossing points for pedestrians.

Other recommendations include installing rapid flash beacons at Naylor Road roundabouts and the right-turn lane at Branch Avenue to alert motorists of crossing pedestrians (see Figure 49). Pedestrians are currently at risk when crossing these roundabouts, as motorists often continue through the intersections without yielding. Rapid flash beacons are user actuated, either by pressing a push button or with the aid of a pedestrian detection system.

Metro's *Pedestrian and Bicycle Element of the 2012-2017 Capital Improvement Program* recommends establishing a formal pedestrian pathway through the Park & Ride lot from the Oxon Run Drive roundabout. Many pedestrians already follow the course of this proposed path when accessing the station, which causes them to cross vehicular traffic at several unmarked locations. This pathway should include paved sidewalks, designated crosswalks, and wayfinding signage. The Park & Ride lot may lose some parking spaces depending on the path's actual alignment, if implemented.

Table 25: Pedestrian and Bicycle Recommendations

| Location | Figure 47 ID | Recommendation |
|---|---|---|
| Naylor Rd | 1 | Add pedestrian signals, crosswalks, and pedestrian refuge areas at Suitland Pkwy intersection |
| | 2 | Add sidewalks on east side between Suitland Pkwy and Oxon Run Dr, and on both sides north of Suitland Pkwy |
| | 3* | Add shared lane markings and "Bikes May Use Full Lane" signs north of Suitland Pkwy |
| | 4 | Add proposed bicycle lanes and shared lane markings south of Suitland Pkwy |
| | 5 | Add proposed sidewalks and remove fence along observed pedestrian desire lines |
| | 6 | Install rapid flash beacons at roundabout crosswalks and crosswalk at the right-turn lane to Branch Ave |
| | 7* | Study additional marked crossing between Good Hope Ave and Branch Ave |
| Branch Ave | 8 | Add sidewalk on east side between station entrance and Southern Ave |
| | 9 | Add proposed bicycle lanes from the District line south |
| | 10 | Add proposed pedestrian signals and crosswalks at all approaches at station entrance intersection |
| | 11 | Add pedestrian refuge areas and reduce northbound right-turn radius at station entrance intersection |
| | 12 | Add proposed new and widened sidewalks south of station entrance intersection |
| | 13* | Study midblock pedestrian hybrid signal south of station entrance intersection |
| Oxon Run Dr | 14 | Add new and widen existing sidewalks |
| | 15* | Add shared lane markings and "Bikes May Use Full Lane" signs |
| | 16 | Add connection to proposed Oxon Run Trail |
| | 17 | Add curb extension, crosswalks, and reduce curb radii at Oxon Park St intersection |
| Good Hope Ave | 18 | Add sidewalks on west side |
| Suitland Pkwy | 19 | Implement proposed Suitland Parkway multi-use path into Maryland |
| Oxon Run Park | 20 | Implement proposed Oxon Run Trail |
| Station Footprint: | 21 | Add pathway from Oxon Run Dr through Park & Ride lot to station entrance |
| Bike & Pedestrian | 22 | Add at least 10 bicycle parking spaces |
| General | N/A | Implement improved wayfinding signage |

** More detailed study and analysis is required to determine overall feasibility*

Figure 49: Rapid Flash Beacon (left) and Existing Naylor Road Roundabout Signs

*Source: Eric O'Brien (Creative Commons, left image only)*

Implementing bicycle lanes and pathways proposed in the 2009 *Prince George's Countywide Master Plan of Transportation* and the 2005 *District of Columbia Bicycle Master Plan* would greatly expand bicycle access. Proposed facilities include a Branch Avenue bicycle lane from the District boundary south to the Capital Beltway (I-495), a Branch Avenue bicycle lane within the District with a terminus at Southern Avenue, and two off-street hard-surface trails: a new Oxon Run Trail (located entirely on M-NCPPC land that will provide access to Naylor Road and Southern Avenue station) and the extension of the Suitland Parkway Trail southeast to Branch Avenue Station from its current terminus at the District line. Implementation of a portion of the Branch Avenue bicycle lanes—from the station entrance to Curtis Drive—is planned as part of the SHA Streetscape Project. Though not proposed in the SHA Streetscape Project, this study recommends further study and analysis of shared lane markings and "Bikes May Use Full Lane" signs on Naylor Road north of Suitland Parkway.

While demand for bicycle parking is low at Naylor Road Station today, improving bicycle access with the recommended lanes and pathways should encourage more cyclists. Metro would need to construct at least 10 additional bicycle parking spaces[2] at Naylor Road Station in support of the agency's 3.5 percent systemwide bicycle mode share goal.

Metro's *Pedestrian and Bicycle Element of the 2012-2017 Capital Improvement Program* recommends placing additional parking within sight of the station manager to reduce the opportunity for theft, a known issue at the station. Given those considerations, the most suitable location for additional bicycle parking is east of the station entrance.

This study recommends the development of consistent wayfinding signage to direct pedestrians and cyclists to the station. Wayfinding signage will be particularly important as bicycle lanes and pathways are constructed, and as the station redevelops and foot traffic increases.

## Bus

Buses operate relatively well at Naylor Road Station, as the bus bays are able to smoothly accommodate all routes that currently serve the station. The current bus bay configuration can adequately serve increases in bus activity estimated for 2040. Therefore, physical changes to the bus bay facility are not needed, though this study assumes the existing facility will be relocated or at least altered as a result of station area redevelopment. Recommendations for bus operations are highlighted in Table 26.

2. A standard U-rack can accommodate two bicycles, while a locker accommodates one.

Nearby Branch Avenue bus stops lack amenities and this study recommends adding amenities to enhance the convenience and accessibility for bus passengers. Additional amenities outside of the study area but within 1/2-mile of the station are needed at stops along Curtis Drive, 28th Parkway, and Berkley Street. Many of these stops lack amenities suggested for basic bus stops, most notably amenities such as sidewalks or ADA-compliant curb ramps. Adding these and other basic amenities, for example schedules, concrete boarding pads, and NextBus information signs, would improve the bus riding experience for existing passengers and possibly attract additional riders. Improving these stops will require coordination between Metro and Prince George's County DPW&T.

Table 26: Bus Recommendations

| Location | Recommendation |
|---|---|
| Bus Bays | Require bus drivers to leave Bay C after discharging passengers |
| | Require operators of large shuttles to apply for a station access permit* |
| General | Add bus stop amenities—benches, shelters, sidewalk connections, and ADA accessibility features—where missing |

** Requires adherence to Metro's shuttle bus policy, two key factors are sufficient bus bay capacity and compliance with insurance requirements.*

Some improvements can be made in the station area, too. Metro should require bus drivers to exit the Bay C drop-off area immediately after discharging all passengers and relocate their bus to either their assigned bay or the layover area, depending on the next scheduled departure time. Supervisors should enforce this and all other standard Metro operating rules to reduce operational conflicts at this occasionally congested location.

Finally, though no private or public shuttle operators serve Naylor Road Station, this study estimates some shuttle activity in the future, most likely once redevelopment is complete. Metro should require shuttle operators in the future to apply for use of station bus bays for large shuttle buses. Issuance of permits is dependent on several factors including bus bay capacity and providers compliance with insurance requirements. More details on Metro's proposed shuttle permitting program can be found in the *Shuttle Services at Metro Facilities* plan.

Bus delay at Naylor Road roundabouts and combined Kiss & Ride/bus bay access points are notable deficiencies, but improvements to these issues should be addressed during development of the final TOD site plan of the station area. Designers should look for opportunities to separate the entrances to these facilities and route buses away from unsignalized intersections with heavy traffic volumes, such as the Naylor Road roundabouts.

## Kiss & Ride

The Kiss & Ride facility as currently configured is large enough to accommodate existing and future demand. However, some signage and striping modifications to the existing Kiss & Ride could improve operations during congested periods. This study assumes that more substantive design changes will likely occur in the future to accommodate station area redevelopment. Recommendations for Kiss & Ride operations are highlighted in Table 27.

In advance of station redevelopment, alteration of the Branch Avenue station entrance should be considered to remove

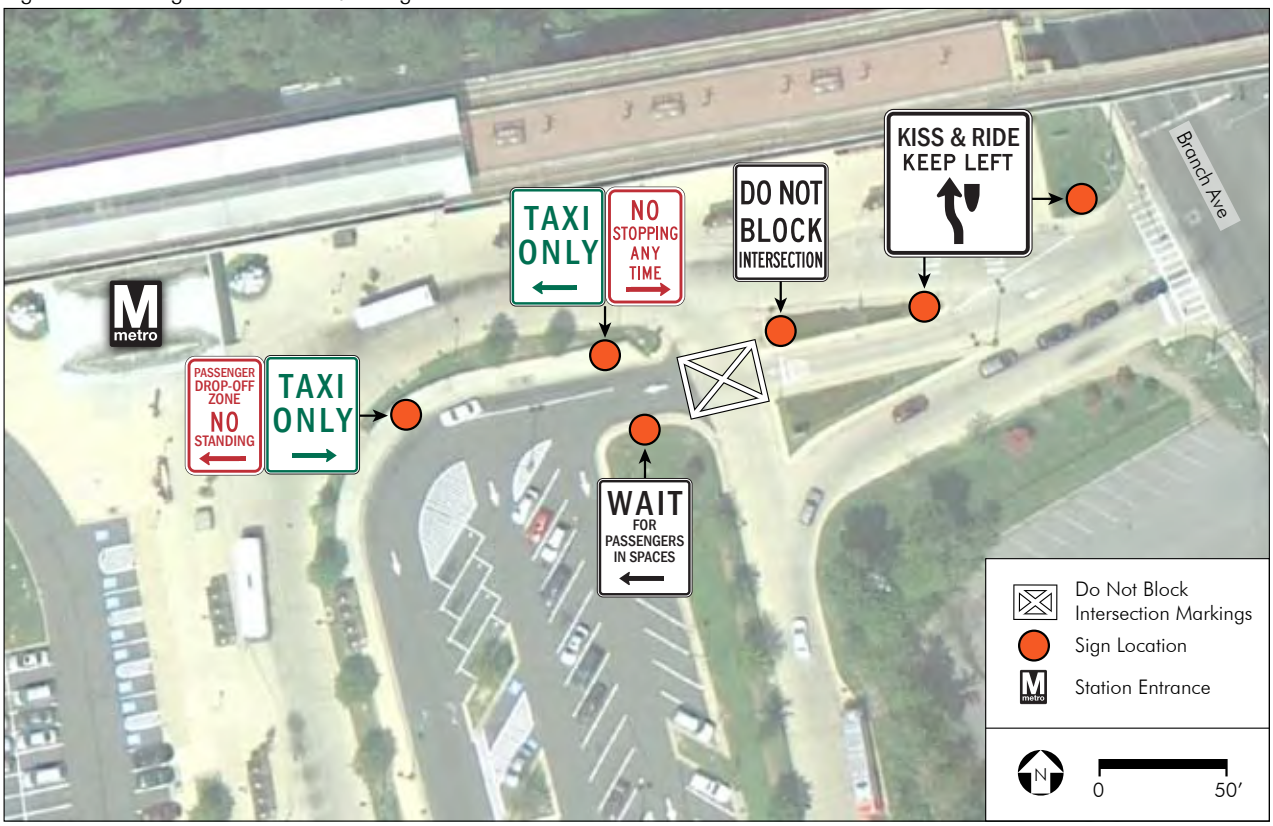
Table 27: Kiss & Ride Recommendations

| Location | Recommendation |
|---|---|
| Kiss & Ride | Improve motorist awareness of Kiss & Ride entrance at Branch Avenue |
| | Add striping and signage to encourage motorists to queue near Kiss & Ride shelters |
| | Designate space for small shuttles |

confusion about how to enter the Kiss & Ride. A large, bold sign with an arrow that states "KISS & RIDE KEEP LEFT" could reduce the frequency of motorists accidentally entering the bus bay facility. In addition, this study recommends signage and pavement markings near the north Kiss & Ride crosswalk to encourage motorists to wait for passengers near the Kiss & Ride shelters. Moving the vehicle queue farther downstream would reduce the likelihood of conflicts with the bus loop. Cross-hatch pavement markings and "DO NOT BLOCK THE INTERSECTION" signs should be added to alert motorists of the bus loop/Kiss & Ride conflict areas, as shown in Figure 50.

Kiss & Rides are required to include dedicated shuttle space based on Metro's *Station Site and Access Planning Manual*. Though not needed now, Kiss & Ride space for use by small shuttles should be formalized in the future when needed. Large shuttles should apply for a permit to use a bus bay. As with bus operations, delay at Naylor Road roundabouts and the combined Kiss & Ride and bus bay access points are problematic and improvements should be considered during development of the final TOD site plan of the station area.

Figure 50: Strategies to Reduce Queuing Conflicts in the Kiss & Ride




*Source: Google Earth (aerial)*

### Park & Ride

Recommendations relating to Naylor Road Station's Park & Ride lot are dependent upon implementation of TOD and therefore summarized in the following section. No changes are recommended to existing Park & Ride operations.

## TOD-Based Recommendations

In order for the established vision of TOD at Naylor Road to be realized, the current station area footprint—comprised of separate bus, Kiss & Ride, and Park & Ride facilities—must be reconfigured to create more developable land. Demand for Park & Ride and bus facilities, however, is estimated to increase in the future. Balancing the vision for a redeveloped station and the need to meet growing access demand will require a variety of strategies.

This study identifies future access and capacity needs at Naylor Road Station, but does not design a site plan for redevelopment of Metro property. Future station access needs in this report will provide context to future planning that will determine the character and layout of station area redevelopment. Exactly what the future station area will look like is presently unknown, and will be largely dependent on future agreements between Metro, Prince George's County, the State of Maryland, and developers seeking to undertake redevelopment of the site. Given this uncertainty, this section proposes a variety of **strategies**, which are individual recommendations tied to and made necessary by transit-oriented redevelopment of the station area. **Options** are groups of strategies designed to accommodate the access needs of Naylor Road Station in 2040. While joint development is expected to begin before 2040, station facilities will need to be designed to accommodate ridership needs over the next several decades.

The options presented here have been grouped into those that achieve access goals by A) shifting parking from the station to other locations, B) replacing the station's parking facilities on-site, or C) expanding the parking facilities of the southern Green Line. Kiss & Ride access would remain at the station under all options. Options are centered on parking because it is a central driver of transit system accessibility, and because its availability is among the most important aspects of successful TOD. While demand for parking is high at Naylor Road Station and will continue to grow in the future, devoting too much space for parking can negatively impact the pedestrian- and transit-friendly environment of TOD as well as reduce the amount of developable land. A balance must be struck to meet station access needs without compromising TOD placemaking principles. Presenting a variety of options provides different means of achieving this desired balance in the future.

### Assumptions

Strategies and options in this section are based on a set of assumptions regarding future development characteristics and future transportation connectivity and accessibility. The following assumptions are composed of factors, constraints, and considerations that influenced the development of TOD-based strategies for Naylor Road Station.

1. Naylor Road Station will be redeveloped into a regional center in compliance with the Branch Avenue Sector Plan's approved M-X-T zone, which permits high-density, mixed-use buildings up to 12 stories high. The tallest buildings would be located the closest to the station entrance.

2. Human-scaled design characteristics that promote walking, cycling, and transit will be prioritized above automobile-oriented development when the station is redeveloped.

3. The entire station footprint will be developed. The existing bus, Kiss & Ride and Park & Ride facilities will be reconfigured to create developable land.

4. Existing station area pedestrian and bicycle recommendations will be addressed as part of future redevelopment plans.

5. The new street network in the final Naylor Road Station site plan will increase access to new development and connect to the existing street network and intersections.

6. The overall amount of Metro-operated parking on the southern Green Line in Prince George's County will not be reduced. In effect, if parking is removed at Naylor Road Station to accommodate development, it will be replaced with parking elsewhere along the southern Green Line.

## Strategies

Strategies presented in this section are individual recommendations tied to and made necessary by TOD redevelopment of the station area. Like the existing station area recommendations, TOD-related strategies are often complementary, and could be implemented in conjunction with one another. This section provides a brief summary of each strategy, highlighting advantages and disadvantages.

Figure 51: Metro's Station Access Hierarchy

*Source: Station Site and Access Planning Manual*

### All-In-One Parking Garage

This study recognizes that the footprint of the Naylor Road Station access facilities—Park & Ride, Kiss & Ride, and bus bay loop—must change to accommodate future joint development. However, demand for these facilities in the future is expected to be at least as great as current demand. One strategy to address both of these circumstances is to combine each facility into an "all-in-one" parking garage with Kiss & Ride facilities and bike parking on the lower level(s), as well as bus facilities. Park & Ride facilities would occupy the upper levels of the all-in-one parking garage. The layout of the modal access facilities in relation to one another would be guided by Metro's station access hierarchy established in the *Station Site and Access Planning Manual* (see Figure 51). Bicycle facilities would occupy those portions of the garage closest to the station entrance, with bus bays next, followed by Kiss & Ride/shuttle facilities and, finally, Park & Ride. Note that the pick-up and drop-off function of a Kiss & Ride only works in a parking garage when

there is no other more convenient location. Careful consideration on locating a future all-in-one parking garage would be needed to ensure that the Kiss & Ride would function as intended. Finally, the facility should be sited so as not to impede pedestrian access, the highest modal priority, in any way.

An example of this concept exists within the Metrorail system in the Park & Ride garage at College Park-U of MD Station, which accommodates multiple modes of access. While the garage's upper levels are designated for daily parking only, the bottom level is reserved for Kiss & Ride. Metro upgraded this garage in May 2012 to include Metrorail's first Bike & Ride facility, a protected bicycle storage area that charges small fees by the hour (Figure 52). Both Bethesda and Friendship Heights stations, as well as other transit stations nationwide (Figure 53), incorporate bus bays into structures, but bus operations are more constrained at Friendship Heights Station as a result of limited space. A parking garage can limit bus operational changes and growth if not planned and designed with care. Additionally, the design of an all-in-one garage should be mindful of passenger comfort and incorporate ample lighting, space, and protection from bus exhaust.

Figure 52: College Park-U of MD Station Bike & Ride

*Source: Matt Johnson (Creative Commons)*

Figure 53: El Monte Station (El Monte, California

*Source: Oran Viryincy (Creative Commons)*

**Advantages**

- Reduces the amount of land devoted to station access modes, particularly parking
- Potentially provides space for a Bike & Ride facility similar to College Park-U of MD Station
- Ability to prioritize access according to Metro's hierarchy by placing bus bays, a Kiss & Ride, and/or a potential Bike & Ride on the lower levels for quicker access to the station entrance
- Possible retail frontage along street-facing sides of the facility (Figure 54)

**Disadvantages**

- Higher capital costs compared to constructing surface lots
- May require shared access between different modes or uses, a noted complaint of Naylor Road Station's existing bus loop and Kiss & Ride shared access points
- May be difficult to fit bus bays and layover space

Figure 54: Examples of Retail in Parking Garages: Athens, GA (left) and Reston Town Center, VA (right)

*Source: Batson-Cook (left image only)*

## Developer-Constructed Parking Garage with Reserved Transit Parking

As part of the joint development process, a developer could construct a parking facility adjacent to the station that accommodates both Metrorail passengers and the retail/residential/office uses included in the development plan. With this strategy, the developer reserves some daily parking for transit customers only. Remaining parking spaces would be made available for retail customers, office employees, and/or residents of the development connected to the garage. Such a facility could possibly incorporate other modes in keeping with the all-in-one garage concept. Wheaton Station, which features Kiss & Ride facilities incorporated into a multi-use building built by a developer, is an example of this approach within the Metrorail system (Figure 55).

Figure 55: Wheaton Station Kiss & Ride Incorporated into Mixed-Use Building

There are many design and operational issues to resolve before implementing this strategy, including access, fee collection, signage, management, enforcement, maintenance, security, and pricing, among others. The design of such a facility could keep transit parking and other parking pools permanently separated by hard barriers or walls, with separate entrances for each pool of users. Barriers could also be movable, allowing all parking to be pooled during weekend days or even in off-peak hours.

Pricing and enforcement, in particular, are two of the most important aspects for a multi-user garage because of the high demand for daily transit parking at Naylor Road Station. If public parking costs less per day than transit parking,

Metro customers would quickly inundate the public portion of the garage once it opens. Metro customers would likely use the public portion of the garage even if it costs more per day than transit parking, up to a point. Metro and the garage owner would need to develop effective pricing and enforcement strategies to discourage transit customers from occupying parking spaces intended for uses related to the adjacent building(s), or vice versa.

**Advantages**

- Construction costs are absorbed by the developer
- Guaranteed number of parking spaces for Metrorail customers
- Reduces the amount of land devoted to parking
- Potentially provides space for other modes in addition to Park & Ride
- Ability to prioritize access according to Metro's hierarchy by placing bus bays, a Kiss & Ride, and/or a potential Bike & Ride on the lower levels for quicker access to the station entrance
- Possible retail frontage along street-facing sides of the garage

**Disadvantages**

- Due to high demand for parking at Naylor Road Station, transit parking customers may spill over into general public parking without tailored pricing and enforcement strategies. Conversely, public parking customers may use transit parking, if available.
- Transit parking spaces are always reserved, even if they go unused at some times of day
- May be difficult to fit bus bays and layover space

## Developer-Constructed Parking Garage with Shared Parking

Similar to the previous strategy, a shared parking garage can serve multiple users within the same facility. However, the difference is that parking is not reserved for any specific use. A shared garage takes advantage of different peak parking times for different land uses to maximize parking utilization throughout the day (Table 28).

Table 28: Peak Parking Periods by Land Use

| Weekday Peak | Evening Peak | Weekend Peak |
|---|---|---|
| Banks, schools, factories, medical clinics, offices | Auditoriums, bars, restaurants, theaters, meeting halls | Religious institutions, parks, shops, malls |

*Source: MacArthur BART Transit Village Shared Parking*

The most successful shared parking garages capitalize on different peak parking times. For example, peak usage for transit Park & Rides occur on weekdays between morning and afternoon peak periods. The most successful shared parking garage with transit parking would include land uses that are not as active during this time period. Evening and weekend peak parking land uses (e.g. bars, restaurants, theaters, shops, and religious institutions) are more compatible with transit parking than weekday peak land uses, in particular office and residential.

The Rosslyn-Ballston Orange Line Corridor in Arlington County is a noted example of shared parking within the region. No transit parking is provided at any of these five Metrorail stations, but all have publicly-available parking nearby that is used by some Metrorail passengers (Park & Ride mode shares at these stations ranged from 3.7 percent at Rosslyn to 7.6 percent at Ballston and 7.8 percent at Virginia Square in the *2007 Metrorail Passenger Survey*) Though not privately owned, Arlington County constructed a shared garage south of Ballston-MU Station for use by

office workers, shoppers, and commuters alike. Market rate fees are charged on an hourly basis and range from $1 for the first three hours to $10 for more than eight hours. For a Metrorail commuter who parks all day, these fees are higher than what he or she would pay at a Metro-operated Park & Ride facility. Weekday-only monthly passes are available for $105.

**Advantages**

- Construction costs are absorbed by the developer
- Reduces amount of overall parking by sharing spaces through land uses with different peaking patterns (e.g. transit parking in the morning and early afternoon, retail in the evening)
- Reduces the amount of land devoted to parking
- Potentially provides space for a Bike & Ride facility similar to College Park-U of MD Station
- Ability to prioritize access according to Metro's hierarchy by placing bus bays, a Kiss & Ride, and/or a potential Bike & Ride on the lower levels for quicker access to the station entrance
- Possible retail frontage along street-facing sides of the garage

**Disadvantages**

- No set number of transit parking spaces
- Difficult to share transit parking with residential and office land uses
- May be difficult to fit bus bays and layover space

### Satellite Parking Lot(s) with Bus/Shuttle Service

Satellite lots provide off-site parking located relatively closely to a Metrorail station. Satellite lots are useful for stations that lack available land for parking or cannot expand existing parking facilities. Ideally, satellite parking should be located along an existing bus route that connects to the station so that individuals do not only rely on carpools or vanpools. If there are no bus routes nearby, satellite lots can be constructed with feeder bus or shuttle service directly to the station. Parking at satellite lots is usually free of charge, but some require permits and fees. Feeder transit services to the Metrorail station and back almost always require a fare if provided on a regular revenue route, but could be offered as a free service if provided through a special shuttle.

This strategy includes two types of common satellite lots that serve transit stations: publicly-owned or shared-use lots. Publicly-owned satellite lots are owned and maintained by the local government, most likely the county in which the parking lot is located. In the context of Naylor Road Station, Prince George's County is likely the only feasible public owner/operator of future satellite lots. With a shared-use lot, a local government or transit agency will lease a private parking lot for use by transit customers during specific periods of time. Churches are often favored for shared-use agreements because their parking is underutilized throughout most of the week. Large shopping centers with plentiful parking are also good candidates for satellite lots because peak retail usage times (afternoon and evening) generally do not overlap with periods of peak transit parking occupancy (morning and midday). Figure 56 and Table 29 identify potential shared-use satellite lots along the southern Green Line. Note that some of these potential shared-use lot locations are zoned M-X-T, increasing the likelihood that they will be redeveloped by 2040. Additional locations farther from Green Line stations would need to be identified if these proposed parcels are selected for use as satellite lots and later redevelop.

Figure 56: Potential Shared-Use Satellite Parking Lots

*Source: Google Earth (aerial)*

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Multiple examples of satellite lots are found throughout the metropolitan Washington region. The Prince George's County-owned Clinton Park & Ride Lot serves the southern Green Line with 100 parking spaces and direct bus service to Branch Avenue and Naylor Road stations. Prince George's County includes several examples of shared-use satellite lots as well: Capital Plaza in Landover, Eastover Shopping Center in Oxon Hill, and Penn-Mar Shopping Center in Forestville. The *Metrorail Station Access Alternatives Study* found that several transit agencies nationwide have implemented successful shared-use satellite lots with dedicated feeder services, including Metra (Chicago, Illinois), Orange County Transit Authority (suburban Los Angeles, California), and Sound Transit (Seattle, Washington). The study concluded that such configurations were most successful at stations with overwhelming demand for parking and high quality feeder services.

**Advantages**

- Expands developable station area if on-site parking is shifted to satellite lots
- Increased utilization of existing underused parking near the station
- Disperses traffic if multiple satellite lots are used
- Can increase bus ridership

**Disadvantages**

- Limited availability of land for new satellite lots near Metrorail stations
- Requires an additional transfer to reach final destination
- Additional expense for local governments to construct and/or maintain facility
- Potential additional expense for transit agency if new or improved bus/shuttle service is required
- Parking is limited to certain time periods for lots with shared-use agreements
- Local communities may oppose additional parking
- Contractual hurdles to overcome in setting up shared-use agreements.

Table 29: Potential Shared-Use Satellite Parking Lots

| Nearest Station | Location | Approximate Parking Spaces | Adjacent Bus Routes | Zoning |
|---|---|---|---|---|
| Southern Avenue | Spirit of Faith Christian Center<br>2261 Oxon Run Drive<br>Temple Hills, MD 20748 | +/- 300 spaces | - | Commercial Shopping Center (C-S-C) |
| Naylor Road | Sam's Plaza<br>3401-37 Branch Avenue<br>Temple Hills, MD 20748 | +/- 50 spaces | Metrobus: C14, H11, H12, H13 | Mixed-Use Transportation Oriented (M-X-T) |
| | Iverson Mall<br>3701 Branch Avenue<br>Temple Hills, MD 20748 | +/- 3,000 surface<br>+/- 300 covered | Metrobus: C12, P12<br>TheBus: 32 | Mixed-Use Transportation Oriented (M-X-T) |
| Suitland | Marlow Heights Shopping Center<br>3901 Branch Avenue<br>Temple Hills, MD 20748 | +/- 1,000 surface | Metrobus: C12, C14, D12, H11, H12, H13 | Mixed-Use Transportation Oriented (M-X-T) |
| | Victory Christian Ministries<br>3911 Saint Barnabas Road<br>Suitland, MD 20746 | +/- 300 spaces | Metrobus: C12, D12, H13 | Mixed-Use Transportation Oriented (M-X-T) |
| | Pennsylvania Station Shops<br>5550 Silver Hill Road<br>District Heights, MD 20747 | +/- 50 spaces | Metrobus: K11, K12, K13, P12 | Commercial Shopping Center (C-S-C) |

## Add Parking to Other Southern Green Line Stations

If daily parking at Naylor Road Station were to be removed it could be offset by adding an equal number of parking spaces to other southern Green Line Stations. The parking facilities of Naylor Road Station (368 spaces) would in theory constitute a modest increase at the other Green Line Stations with much larger existing parking facilities: Southern Avenue (1,980 spaces), Suitland (1,890 spaces), and Branch Avenue (3,072). While this strategy maintains the same overall number of parking spaces along the southern Green Line, implementing additional parking at other stations would pose challenges.

The Southern Avenue Station footprint is large enough to accommodate additional Park & Ride capacity. About half of the station area is already consumed by a large parking garage. The other half contains surface lots that could be converted into additional structured parking. However, the station lacks quick and convenient access to limited-access highways like Suitland Parkway and I-495, making it a less-desirable transfer destination for Park & Ride passengers. The Suitland Station footprint is already mostly occupied by structured parking and opportunities to add more daily parking would be limited and likely more expensive than other southern Green Line Stations. The Branch Avenue Station footprint has the most usable space of all these options as a result of surface parking. However, the station has long been considered a prime candidate for joint development (see Metro's 2010 *Branch Avenue Station Access and Joint Development Study*). Additional Park & Ride capacity could be incorporated into the parking replacement at the Branch Avenue station as part of a future Branch Avenue TOD redevelopment.

**Advantages**

- Expands developable area at Naylor Road Station if on-site parking is removed
- Maintains current amount of southern Green Line parking

**Disadvantages**

- Capital costs of constructing new structured parking
- Limited options for additional parking on southern Green Line
- Local communities may oppose additional parking
- Accommodating additional traffic near other stations
- Absorbing additional passenger volume within other stations at entrances, mezzanines, and on platforms

## Real-Time Parking Information

Real-time parking information notifies motorists of parking availability. Such information is updated on a continual basis as parking supply fluctuates throughout the day. Basic real-time parking information systems can be as simple as electronic signs at Park & Ride entrances that warn motorists of a full garage. These simple systems reduce time wasted searching for a parking space, but are less effective compared to more sophisticated systems because they only interact with the transit customer once a driving trip has already begun. More complex systems provide up-to-date digital information that is viewable on computers and other mobile devices. Such systems are more effective because they can reduce driving trips. Motorists may view real-time parking information before beginning their trip and decide that an alternative mode of access is faster because parking at the nearest station is already full. Metro is currently testing a real-time parking information system for Fort Totten and Rockville Station metered parking

(Kiss & Ride) and at one of Vienna Station's commuter surface lots. This pilot project, which began in July 2012, provides hourly parking occupancy data (both available and in-use spaces) as well as historical occupancy averages online. In addition, Vienna Station's participant surface lot features a real-time electronic "lot full" entrance sign.

**Advantages**

- Reduces time spent searching for a space
- Encourages alternative modes of access
- Promotes more efficient use of systemwide parking resources
- Low capital costs compared to building new parking facilities
- Creates a foundation for dynamic pricing

**Disadvantages**

- Testing and roll-out period for more advanced information systems
- System maintenance

## Preferred Carpool Parking and Discounts

Carpooling allows for greater use of limited parking facilities by serving more transit customers with the same number of parking spaces. The *Metrorail Station Access Alternatives Study* observed that Bay Area Rapid Transit (San Francisco, California) and Tri-Met (Portland, Oregon) have incentivized carpooling through preferred, designated parking spots and even discounts on parking fees. Montgomery County operates a similar program in the Silver Spring District. At these garages within Silver Spring, priority carpool spaces are available until 9:30 AM and carpoolers can register for reduced monthly parking fees, which decrease as carpool sizes increase. For example, monthly parking fees start at $113 per month for a single-occupant vehicle, but are as little as $10 per month for a five-person carpool. Some restrictions apply, and Montgomery County requires all members of the carpool to register to reduce fraud.

**Advantages**

- Increased utilization of limited parking capacity
- Can increase rail ridership

**Disadvantages**

- Potential for carpool parking pass fraud
- Required management and enforcement of carpool discount program
- Most successful along corridors with high-occupancy vehicle (HOV) interstate lanes

## Enhanced Bus Connectivity

Bus ridership is already very high at Naylor Road Station, and it is estimated to continue to grow into the future. Capitalizing on this growing demand with improved bus service would improve the convenience for existing passengers and help attract new riders. Enhancing bus connectivity can be achieved by increasing bus frequency, realigning routes to better serve passengers in a timelier manner, and/or adding new routes. Implementing lower-cost neighborhood circulator service may attract additional riders that would have otherwise driven to Naylor Road Station. Hillcrest Heights south of the station would benefit the most from neighborhood circulator, as other nearby neighborhoods are well served by existing transit.

**Advantages**

- Increases convenience for existing bus passengers
- Encourages Park & Ride customers to take the bus
- Attracts new bus riders
- Can increase rail ridership

**Disadvantages**

- Increases capital and operating costs of new and enhanced bus services
- Potential service cuts during poor economic conditions

## Options

Options are groups of strategies designed to achieve one of the following outcomes: shift, replace, or expand parking. This study recognizes that there are multiple approaches to achieving these outcomes, and presents nine total options (Table 30). The goal for each option is to balance Park & Ride access demand with Naylor Road Station's future as a TOD regional center. Assumptions previously outlined apply to all options, including that existing station area pedestrian and bicycle recommendations will be addressed in the final TOD site plan. Note that enhanced bus connectivity is a strategy in every option. Regardless of which option is pursued for Naylor Road Station, bus connectivity should be enhanced to meet estimated future demand. Enhanced bus services would further energize the station area with opportunities for further activity outside the peak periods, something that the peak-only nature of a Park & Ride facility would not provide. As shown in Figure 57, bus transfers to Metrorail are not as heavily concentrated in the morning peak as Park & Ride passengers, nor as concentrated in the afternoon peak as passengers who arrive by walking.

Table 30: Summary of Options

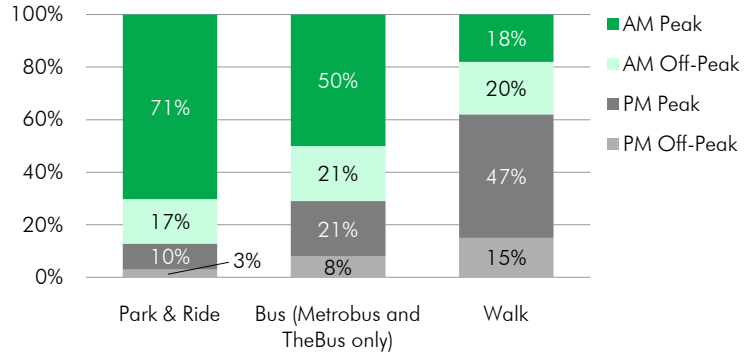
| | Outcomes | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Shift Parking | | | Replace Parking | | | Expand Parking | | |
| | Options | | | | | | | | |
| Strategies | A1 | A2 | A3 | B1 | B2 | B3 | C1 | C2 | C3 |
| All-in-one access facility (bicycle, bus, Kiss & Ride, and/or Park & Ride within the same garage) | | | | ● | ● | ● | ● | ● | ● |
| Developer-constructed garage with reserved transit parking in a mixed-use building | | | | | ● | | | | |
| Developer-constructed parking garage with shared transit parking in a mixed-use building | | | | | | ● | | | |
| Publicly-owned satellite parking facility with feeder transit service to Green Line stations | | ● | | | | | | ● | |
| Satellite parking through shared-use agreements with feeder transit service to Green Line stations | | | ● | | | | | | ● |
| Additional parking to other Green Line stations | ● | | | | | | ● | | |
| Real-time parking information | | | | ● | ● | ● | ● | ● | ● |
| Preferred carpool parking and/or discounts | | | | ● | ● | ● | ● | ● | ● |
| Enhanced bus connectivity | ● | ● | ● | ● | ● | ● | ● | ● | ● |

## Outcome A: Shift Parking

**Option A1: Expanded Parking at Other Southern Green Line Stations**

Option A1 proposes removing the existing Park & Ride lot to accommodate planned joint development. To offset the loss of 368 parking spaces, this option proposes enhanced bus connectivity and replacing lost parking by adding an equivalent number of daily parking spaces to other southern Green Line stations. As previously noted, implementing additional parking at other stations may be undesirable.

Figure 57: Daily Distribution of Trips (Systemwide)




*Source: 2007 Metrorail Passenger Survey*

**Option A2: Publicly-Owned Satellite Parking**

Similar to Option A1, Option A2 proposes removing the existing Park & Ride lot to accommodate joint development and partially offsetting the loss of 368 parking spaces with enhanced bus connectivity. However, instead of adding Park & Ride capacity to other southern Green Line stations as in Option A1, Option A2 proposes constructing publicly-owned satellite parking with feeder transit service to the closest Green Line stations. Locating undeveloped land that is close for additional satellite parking may be difficult.

**Option A3: Shared-Use Satellite Parking**

Option A3 is almost identical to Option A2. However, Option A3 proposes additional satellite parking under shared-use agreements for existing parking lots. This report previously identified several locations for potential shared-use satellite lots, including Spirit of Faith Christian Center, Sam's Plaza, Iverson Mall, Marlow Heights Shopping Center, Victory Christian Ministries, and Penn Station Shops. Note that some of these lots are located closer to Green Line stations other than Naylor Road Station. Some of these lots are also along existing bus routes.

## Outcome B: Replace Parking

**Option B1: Metro-Owned All-In-One Garage**

Option B1 proposes removing the existing Park & Ride surface lot and replacing an equivalent number of daily parking spaces with a Metro-owned and operated garage that also accommodates bicycle parking, buses, and/or Kiss & Ride. Unifying several station area facilities into one structure would greatly expand developable land. The total number of daily parking spaces would remain below unconstrained future demand for parking at Naylor Road Station. Option B1 proposes maximizing the use of limited parking with preferred carpool spaces and/or carpool discounts. Real-time parking information and enhanced bus service to Naylor Road Station would complement efforts to encourage Metrorail customers to arrive via alternative modes of transportation.

**Option B2: Developer-Owned All-In-One Garage with Reserved Transit Parking**
Option B2 includes the same strategies in Option B1, except that the all-in-one garage would be constructed and operated by a developer as part of a mixed-use development. Option B2 proposes that this garage reserve an equivalent number of parking spaces for Metrorail customers as was available before redevelopment (368 spaces). Other parking in the garage would be reserved for other uses or available for public use for a fee. Pricing and enforcement for public parking would be important aspects for this garage because of the high demand for daily transit parking at Naylor Road Station. Metro and the garage owner would need to develop effective pricing and enforcement strategies to discourage transit customers from occupying parking spaces intended for uses related to the adjacent building(s).

**Option B3: Developer-Owned All-In-One Garage with Shared Transit Parking**
Option B3, like Option B2, proposes an all-in-one garage constructed and operated by a developer as part of a mixed-use building. However, Option B3 proposes shared transit parking for the entire garage rather than reserved transit parking. Transit parking is not reserved under a shared arrangement, but Metrorail customers could park in any space. Motorists who parks at the station would pay market rate, which could be more expensive than Metro's daily parking rate. A shared parking arrangement for use by Metrorail would work best with evening and weekend peak parking land uses (e.g. bars, restaurants, theaters, shops, and religious institutions). Aside from the operations of the all-in-one garage, Option B3 also proposes the same strategies as Option B1 and B2.

## Outcome C: Expand Parking

**Option C1: Combined Options A1 and B1**
Option C1 proposes expanding parking by implementing almost all strategies from Options A1 and B1. More specifically, Option C1 proposes removing the existing Naylor Road Park & Ride and replacing it with a Metro-operated all-in-one parking garage with real-time parking information and preferred carpool spaces and discounts. This option also proposes additional parking to other southern Green Line stations.

**Option C2: Combined Options A2 and B1**
Option C2 is similar to Option C1, except that it proposes publicly-owned satellite parking with feeder transit service instead of additional southern Green Line station parking. Option C2 would thus expand parking with off-site satellite lots in addition to an on-site Metro-owned all-in-one garage to replace existing Park & Ride capacity. Similar to Option C1, Option C2 proposes real-time parking information and preferred carpool spaces and discounts for the new garage.

**Option C3: Combined Options A3 and B1**
Similar to Option C2, Option C3 proposes shared-use satellite lots with feeder transit service. An on-site Metro-owned all-in-one parking garage would replace existing Park & Ride capacity at Naylor Road Station to expand developable land. Similar to Option C1, Option C3 proposes real-time parking information and preferred carpool spaces and discounts for the new garage.

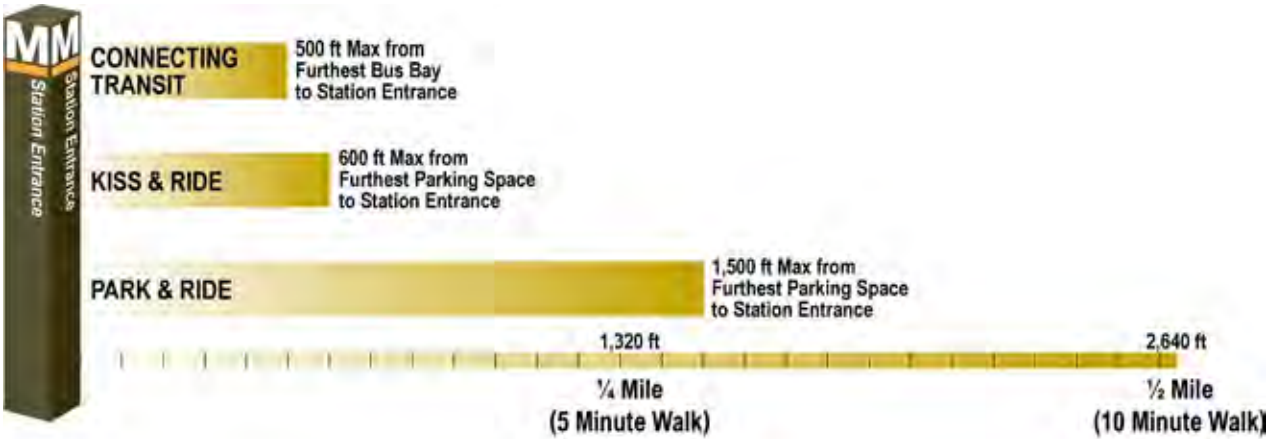
## Location Considerations for Access Facilities

Construction of new, permanent station area access facilities will be located on land currently occupied by existing facilities. As a result, the Naylor Road Station area will likely require temporary relocation of these facilities to maintain access during implementation of the station area site plan. The potential locations of both permanent and temporary access facilities are governed by Metro's *Station Site and Access Planning Manual*, which sets guidelines for maximum allowable walking distances between station facilities and entrance (Figure 58).

The distances highlighted in Figure 58 are in accordance to Metro's station access hierarchy. Maximum walking distances to the station entrance are shortest for access modes prioritized by this hierarchy. Bus bay facilities can be no farther than 500 feet from the station entrance and the farthest Kiss & Ride space must be within 600 feet. Park & Ride spaces, which have the lowest priority, can be located as far as 1,500 feet from the station entrance. These distances and other constraints in the Naylor Road Area provide a spatial framework for possible locations of station access facilities, as shown in Figure 59. Most of the land within the maximum allowable walking distances from the station entrance for new temporary and permanent access facilities is unavailable due to constraints such as existing residential areas, federal land, and parkland. All potentially available land is located south of the Green Line tracks and corresponds closely with the new M-X-T zoning devised in the Branch Avenue Corridor Sector Plan.

Four potential locations for station-access facilities remain once constraints are taken into consideration, as shown in Figure 60. Location 1 is split into three separate sub-locations to reflect the maximum allowable walking distances for facility types (see Table 31). Bus bay and Kiss & Ride facilities must be located within the existing station area footprint due to shorter allowable walking distances for these modes. However, Metro could locate a Park & Ride facility in any of the four potential locations.

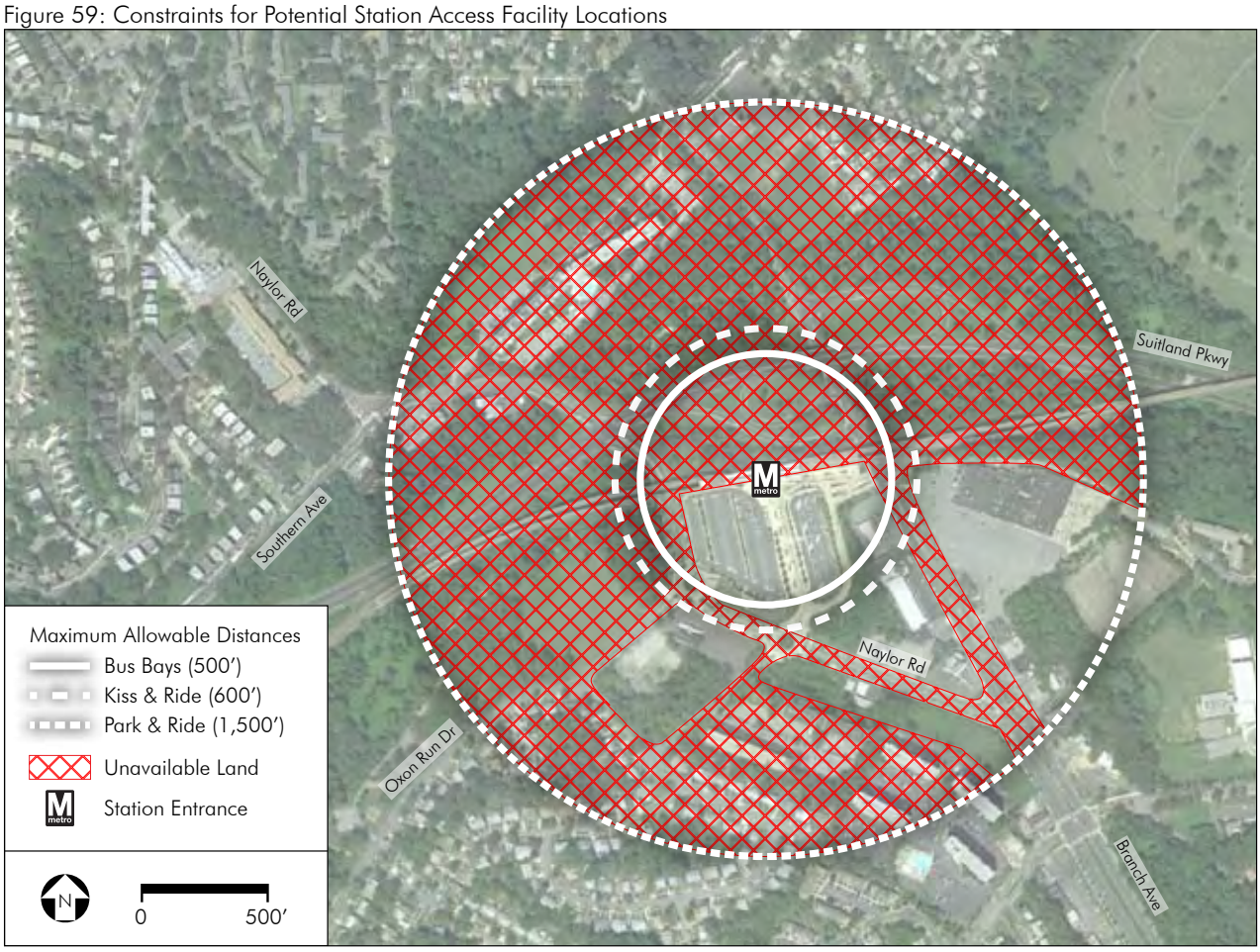
Figure 58: Allowable Walking Distances between Station Facilities and Entrance




*Source: Station Site and Access Planning Manual*

Opportunities and constraints of each location—for example the existing structures and station operations, utilities, topography, land ownership, community concerns, access facility design requirements, costs, and final station area site plan and implementation timeline for joint development, among others—should be considered during the site selection and design phase for temporary and permanent access facilities. Though this study does not recommend specific facility locations, schematics, or designs, Table 31 highlights where Metro could potentially construct facilities as well as some general considerations for each site. The most common constraints for Locations 2, 3, and 4 include costs to purchase additional land, impacts to existing businesses, and forcing customers to cross busy roadways. Location 1 is closer to the station entrance and Metro already owns much of this land. However, Location 1 will be the focal point for joint development and the actual availability of land may be constrained once a final site plan is defined. Note that each location is large and would allow for many different facility configurations. Narrowing down the specific facility setting within any of the four general locations is reserved for more detailed planning and design at a later date.

Figure 59: Constraints for Potential Station Access Facility Locations

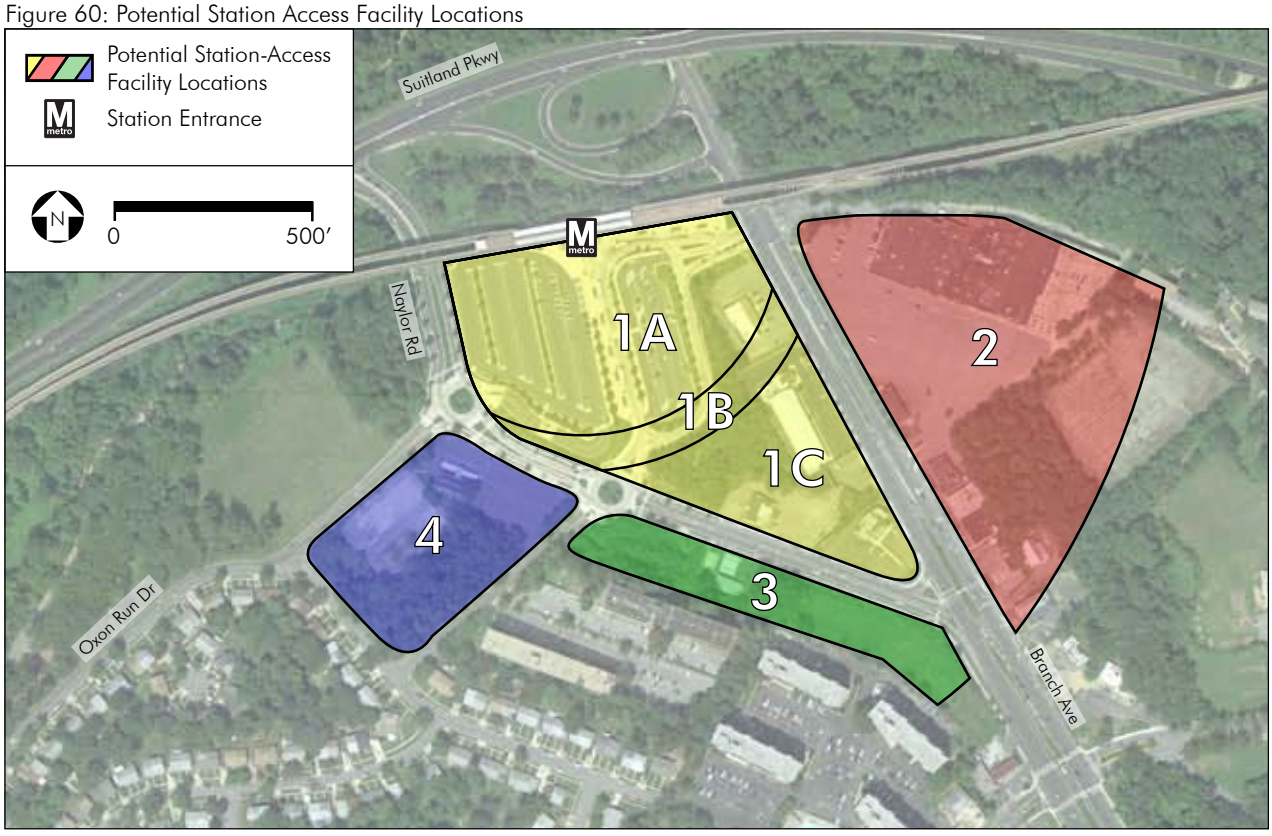



*Source: Google Earth (aerial)*

Table 31: Opportunities and Constraints of Potential Station-Access Facility Locations

| Figure 60 Map ID | Based on Maximum Allowable Walking Distance to Station Entrance | | | Opportunities | Constraints |
|---|---|---|---|---|---|
| | Bus Bays | Kiss & Ride | Park & Ride | | |
| 1A | ● | ● | ● | – Proximity to station entrance<br>– Metro owns most of the land | – Impacts existing station access facilities<br>– Impacts existing business<br>– Land purchase may be required |
| 1B | | ● | ● | – Proximity to station entrance<br>– Metro owns most of the land | – Impacts existing station access facilities<br>– Impacts existing business<br>– Land purchase may be required |
| 1C | | | ● | – Does not impact operations of existing access facilities | – Impacts existing businesses<br>– Land purchase required |
| 2 | | | ● | – Does not impact operations of existing access facilities<br>– Vehicular traffic reduced at Naylor Road roundabouts | – Customers must cross Branch Avenue<br>– Impacts existing businesses<br>– Land purchase required<br>– Most likely redeveloped first |
| 3 | | | ● | – Does not impact operations of existing access facilities | – Customers must cross Naylor Road<br>– Impacts existing business<br>– Land purchase required<br>– Relatively narrow with steep topography<br>– Adjacent to existing residential area<br>– Non-standard size parking garage<br>– Constrained vehicular access |
| 4 | | | ● | – Does not impact operations of existing access facilities<br>– Customers have a history of parking at this location | – Customers must cross Naylor Road<br>– Impacts existing business<br>– Land purchase required<br>– Adjacent to existing residential area |

Figure 60: Potential Station Access Facility Locations



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# Appendices

## Appendix 1: References


Alameda County Congestion Management Agency, *MacArthur BART Transit Village Shared Parking*, 2007

District of Columbia, *District of Columbia Bicycle Master Plan*, 2005

FHWA, *Manual on Uniform Traffic Control Devices*, 2009

Metro, *Branch Avenue Station Access and Joint Development Study*, 2010

Metro, *Glenmont Station Access Improvement Study*, 2012

Metro, *Guidelines: Design and Placement of Transit Stops*, 2009

Metro, *Metrorail Bicycle and Pedestrian Access Improvement Study*, 2010

Metro, *Metrorail Passenger Survey*, 2007

Metro, *Pedestrian and Bicycle Element of 2012-2017 Capital Improvement Program*, 2011

Metro, *Shuttle Services at Metro Facilities*, 2011

Metro, *Station Site and Access Planning Manual*, 2008

Metro, *Station Access & Capacity Study*, 2008

M-NCPPC, *Preliminary Branch Avenue Corridor Sector Plan and Sectional Map Amendment*, 2008

M-NCPPC, *Countywide Master Plan of Transportation*, 2009

M-NCPPC, *Metro Green Line Corridor Action Plan* (ongoing)

M-NCPPC, *Naylor Road Metro Station Area Accessibility Study*, 2011

MWCOG, *Metrorail Station Access Alternatives Study*, 2012

MWCOG, *Regional Bus Study*, 2008

NFPA, *NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems*, 2007

Prince George's County, *Countywide Master Plan of Transportation*, 2009

Prince George's County, *Prince George's County Approved General Plan*, 2002

SHA, *MD 5 (Branch Avenue) and MD 637 (Naylor Road) Streetscape Improvements* (ongoing)

TCRP, *TCRP Report 100: Transit Capacity and Quality of Service Manual*, 2003

# Appendix 2: Nationwide Examples of Multimodal Bus Stations

## Alewife Station (Cambridge, MA)

Alewife Station, a MBTA (Massachusetts Bay Transportation Authority) intermodal transportation hub, is located in Cambridge, Massachusetts. It is the northern terminus of the MBTA's Red Line and a bus terminal for several local routes and one intercity route. This station features a large five-story Park & Ride facility with 2,733 available parking spaces. The station connects to local bike paths and a secure bike parking area with approximately 174 bicycle spaces. The mezzanine is located at the main entrance of the station and leads up to another level that features to a bus loop and passenger drop-off area.

## Cumberland Station (Chicago, IL)

Cumberland Station, located in Chicago, Illinois, is located on the CTA (Chicago Transit Authority) Blue Line. The station features two enclosed elevated walkways that enable pedestrians to access the station from various locations on either side of the highway. The north walkway leads passengers to a stairway to the ground, while the walkway heading south leads to a central pavilion, bus terminal, Park & Ride garage, as well as different entrances and exits. The parking garage has 1,633 spaces available for use, in addition to indoor and sheltered bicycle parking. Cumberland Station provides connections to CTA buses, Pace buses (suburban network), and Greyhound buses.

Figure A-1: Alewife Station (Cambridge, MA)

*Source: Eric Kilby (Creative Commons)*

*Source: kbrookes (Creative Commons)*

Figure A-2: Cumberland Statioon (Chicago, IL)

*Source: Graham Garfield (CTA Collection)*

*Source: CTA Collection*

## South Hills Village Station (Upper St. Clair, PA)

The South Hills Village Station is located in Upper St. Clair, Pennsylvania, situated at the end of the Pittsburgh Light Rail system's Red Line. The station also provides a connection to bus route 36 to downtown Pittsburgh. This station features a large parking garage with 2,200 available spaces as well as bicycle parking. The garage provides direct access to the station through a sheltered pedestrian foyer. The station itself is located at the center-back (south side) of the first floor of the garage.

## North Springs Station (Sandy Springs, GA)

North Springs Station is a part of the Metropolitan Atlanta Rapid Transit Authority (MARTA) heavy rail system and the northern terminus of the Red Line. This station features a direct exit and entrance to Georgia State Route 400, which allows direct access for motorists north of the station without having to use surface streets. North Springs Station features 14 bike racks in addition to a large parking garage that features 2,325 daily and long-term parking spaces. The lower level of North Springs Station houses the mezzanine as well as a bus-to-rail transfer area, which serves five connecting bus routes.

Figure A-3: South Hills Village Station (Upper St. Clair, PA)

*Source: Matt Johnson (Creative Commons)*

*Source: Google Earth*

Figure A-4: North Springs Station (Sandy Springs, GA)

*Source: Matt Johnson (Creative Commons)*

# Appendix 3: 2040 Ridership and Mode Share

The study team estimated 2040 ridership and mode share using the MWCOG travel demand model, which has been updated for the Purple Line project to meet FTA requirements, and data from the *2007 Metrorail Passenger Survey*. The most recent Naylor Road Station weekday entry data from May 2012 (3,160 average entries per weekday) served as a base for this mode share estimate.

The study team first calculated mode share values from the 2*007 Metrorail Passenger Survey*, which represents the most recent record of ridership by mode. Table A-1 summarizes mode share values from the 2007 Metrorail Passenger Survey. These 2007 mode shares in Table A-1 were applied to the 2012 ridership data to estimate a 2012 entry profile for Naylor Road Station, shown in Table A-2.

The study team ran the travel demand model using the information from Table A-2, which resulted in estimated peak and off-peak 2040 entries. Peak and off-peak period growth factors for each mode were calculated by comparing observed 2012 and estimated 2040 entries, as shown in Table A-3. The model defines the peak period as the combined morning and afternoon peak periods and the off-peak period as all hours of revenue service outside of the peak period.

Table A-1: Weekday Naylor Road Station Mode Share from the 2007 Metrorail Passenger Survey (all day)

| Category | Park & Ride** | Kiss & Ride | Bus | Walk/Bike | Total |
|---|---|---|---|---|---|
| Access and Egress Average* | 23% | 12% | 46% | 19% | 100% |

** Access and egress are averaged because survey results from the 2007 Metrorail Passenger Survey varied considerably for Naylor Road Station. These varied results are likely due to the small number of completed surveys for the station.*

*** Includes passengers who drove and passengers who rode with someone who parked*

Table A-2: Estimated 2012 Weekday Mode Share of Naylor Road Station (all day)

| Category | Park & Ride* | Kiss & Ride | Bus | Walk/Bike | Total |
|---|---|---|---|---|---|
| Entries | 727 | 379 | 1,454 | 600 | 3,160 |
| Mode Share | 23% | 12% | 46% | 19% | 100% |

** Includes passengers who drove and passengers who rode with someone who parked*

Table A-3: Model Results

| Time of Day | Park & Ride* | Kiss & Ride | Bus | Walk/Bike | Total |
|---|---|---|---|---|---|
| 2012 Base | | | | | |
| Peak | 663 | 274 | 1,151 | 476 | 2,222 |
| Off-Peak | 63 | 105 | 302 | 125 | 938 |
| Daily | 727 | 379 | 1,454 | 600 | 3,160 |
| Daily Mode Share | 23% | 12% | 46% | 19% | 100% |
| 2040 Estimate | | | | | |
| Peak | 646 | 141 | 1,556 | 661 | 3,004 |
| Off-Peak | 169 | 26 | 327 | 491 | 1,013 |
| Daily | 815 | 167 | 1,883 | 1,152 | 4,017 |
| Daily Mode Share | 20% | 4% | 47% | 29% | 100% |
| Growth Factors | | | | | |
| Peak | -3% | -49% | 35% | 39% | 35% |
| Off-Peak | 167% | -75% | 8% | 294% | 8% |
| Daily | 12% | -56% | 30% | 92% | 27% |

** Includes passengers who drove and passengers who rode with someone who parked*

The travel demand model outputs Park & Ride, Kiss & Ride, and "walk" mode shares, but the "walk" mode share is a sum of walk and bus trips. To separate walk and bus trips into two distinct categories, the study assumed that bus trips would grow at the same rate as total station ridership growth. The remaining trips from the model's "walk" category were assigned to a distinct walk category.

Table A-3 summarizes the 2040 entries and 2012-to-2040 growth factors for Naylor Road Station. The final row of Table A-3 highlights the resulting 2040 daily mode share estimate.

# Appendix 4: Bus Bay Requirements

Determining the number of bus bays required to accommodate future service began with a calculation of existing utilization rates for each bus bay. Table A-4 shows the calculation of bus bay requirements by route, and Table A-5 shows the rate of utilization by bus bay. Existing peak hour headways and recovery times were derived from data provided by Metro and TheBus. All routes include a minimum dwell time of one minute, and any scheduled dwell time over one minute was entered as recovery time.

To estimate at the number of buses that will serve Naylor Road Station during the peak hour in 2040—and thus the required number of bus bays—the analysis used the passenger load metric (see Table A-6), which is equal to the occupancy of the bus at the station. Because the passenger load includes riders passing through a point as well as those exiting or entering at a point, it provides a more complete picture of demand for bus service.

The analysis assumed that the passenger loads for all routes that serve at Naylor Road Station are approximately 35 passengers per bus. These per-bus passenger loads were multiplied by the number of buses that serve the station during the peak hour (Table A-4), and then multiplied by the percent increase in peak-period bus passengers estimated from the travel demand model. The result, shown in Table A-6, is a route-by-route estimate of average peak hour passenger loads at Naylor Road Station by 2040.

Table A-4: Existing Bus Bays Required

| Route | (A) Peak Hour Headway (minutes) | (B) Buses per Peak Hour | (C) Average Recovery Time (minutes) | (D) Average Total Time at Bay per Bus (minutes) | (E) Tolerance Time (minutes) | (F) Bays Required |
|---|---|---|---|---|---|---|
| Metrobus | | | | | | |
| M2 | 20 | 3.0 | 3 | 4 | 4 | 0.4 |
| F14 | 30 | 2.0 | 5 | 6 | 4 | 0.3 |
| H11/12/13 | 15 | 4.0 | 6 | 7 | 4 | 0.7 |
| C12/C14 | 25 | 2.4 | 4 | 5 | 4 | 0.4 |
| 36 | 15 | 4.0 | 9 | 10 | 4 | 0.9 |
| 39 | 15 | 4.0 | 0 | 1 | 4 | 0.3 |
| 34 | 15 | 4.0 | 5 | 6 | 4 | 0.7 |
| TheBus | | | | | | |
| 32 | 30 | 2.0 | 8 | 9 | 4 | 0.4 |
| Total | | 25.0 | | | | 6.0 |

D. Average Total Time at Bay per Bus = One-minute dwell time + C
E. Tolerance Time = Accounts for the variation of arrival times (two minutes for through buses and four minutes for terminating buses)
F. Bays Required = ((D + E) * B) / 60

Table A-5: Existing Bus Bay Utilization

| Route | Provider | Bus Bay | (G) Buses per Peak Hour | (H) Total Time at Bay (minutes) | (I) Bay Utilization |
|---|---|---|---|---|---|
| M2 | Metrobus | A | 3 | 24 | 40% |
| F14 | Metrobus | B | 2 | 20 | 33% |
| Drop off only | - | C | - | - | - |
| H11/12/13 | Metrobus | D | 4 | 44 | 73% |
| C12/C14 | Metrobus | E | 2.4 | 22 | 36% |
| 36, 39 | Metrobus | F | 8 | 76 | 127% |
| 34 | Metrobus | G | 4 | 40 | 67% |
| 32 | TheBus | H | 2 | 26 | 43% |

G. Buses per Peak Hour = $\sum$ B per bay
H. Total Time at Bay = $\sum$ (B * (D + E)) per bay
I. Bay Utilization = H / 60

Table A-7 summarizes the estimate of required Naylor Road Station bus bays per route by 2040. The number of buses per peak hour by 2040 is calculated by dividing the 2040 average peak hour passenger load by the assumed capacity of a typical bus, in this case

Table A-6: Average Peak Hour Bus Passenger Loads at Naylor Road Station (Year 2040)

| Route | (J) Average Peak Hour Passenger Load per Bus | (K) 2012 Average Peak Hour Passenger Load | (L) 2012-2040 Percent Increase in Bus Passengers | (M) 2040 Average Peak Hour Passenger Load |
|---|---|---|---|---|
| Metrobus | | | | |
| M2 | 35 | 105 | 35% | 142 |
| F14 | 35 | 70 | 35% | 95 |
| H11/12/13 | 35 | 140 | 35% | 189 |
| C12/C14 | 35 | 84 | 35% | 113 |
| 36 | 35 | 140 | 35% | 189 |
| 39 | 35 | 140 | 35% | 189 |
| 34 | 35 | 140 | 35% | 189 |
| TheBus | | | | |
| 32 | 35 | 70 | 35% | 95 |
| J. Assumed average peak hour passenger load per bus at Naylor Road Station | | | | |
| K. 2012 Average Peak Hour Passenger Load = B * J | | | | |
| L. Percent increase in bus passengers taken from Table A-3 in Appendix 3 | | | | |
| M. 2040 Average Peak Hour Passenger Load = K * (1+L) | | | | |

Table A-7: Bus Bays Required (Year 2040)

| Route | (N) Buses per Peak Hour | (O) Peak Hour Headway (minutes) | (P) Average Recovery Time (minutes) | (Q) Average Total Time at Bay per Bus (minutes) | (R) Bays Required |
|---|---|---|---|---|---|
| Metrobus | | | | | |
| M2 | 4 | 15 | 3 | 4 | 0.5 |
| F14 | 3 | 20 | 5 | 6 | 0.5 |
| H11/12/13 | 5 | 12 | 6 | 7 | 0.9 |
| C12/C14 | 3 | 20 | 4 | 5 | 0.5 |
| 36 | 5 | 12 | 9 | 10 | 1.2 |
| 39 | 5 | 12 | 0 | 1 | 0.4 |
| 34 | 5 | 12 | 5 | 6 | 0.8 |
| TheBus | | | | | |
| 32 | 3 | 20 | 8 | 9 | 0.7 |
| Total | 33 | | | | 7.0 |
| N. Buses per Peak Hour in 2040 = M / 40 (Passenger capacity per bus) [results were rounded up to the nearest whole number] | | | | | |
| O. Peak Hour Headway = 60 / N | | | | | |
| Q. Average Total Time at Bay per Bus = One-minute dwell time + P | | | | | |
| R. Bays Required by 2040 = ((Q + E) * N) / 60 | | | | | |

Table A-8: Bus Bay Utilization (Year 2040)

| Route | Provider | Bus Bay | (S) Buses per Peak Hour | (T) Total Time at Bay (minutes) | (U) Bay Utilization |
|---|---|---|---|---|---|
| M2/C12/C14 | Metrobus | A | 7 | 59 | 98% |
| F14/TB32 | Metrobus, TheBus | B | 6 | 69 | 115% |
| H11/12/13 | Metrobus | C | 5 | 55 | 92% |
| 36 | Metrobus | D | 5 | 70 | 117% |
| 39 | Metrobus | E | 5 | 25 | 42% |
| 34 | Metrobus | F | 5 | 50 | 83% |
| Spare/Drop off | - | G | - | - | - |
| S. Buses per Peak Hour = ∑ N per bay | | | | | |
| T. Total Time at Bay = ∑ (N * (Q + E)) per bay | | | | | |
| U. Bay Utilization = T / 60 | | | | | |

40 passengers. While some routes may use articulated buses, using a 40-passenger-per-bus capacity provides a more conservative estimate. To estimate the number of bays required, the same methodology employed in Table A-4 is used in Table A-7. The same average recovery time from Table A-4 is assumed in Table A-7. However, in practice several variables are factored into how much time is allotted per bus at a terminal stop (e.g. restroom or meal breaks, scheduling needs, etc.).

Table A-8 reveals the final calculations of the analysis to estimate the bus bay utilization in 2040. Calculations in Table A-8 are similar to those in Table A-5. Table A-8 proposes new bus bay route assignments for seven bays (six active bays and one drop-off bay) as calculated in Table A-7. Bus bay utilization in Table A-8 may be above 100 percent, but actual utilization at these bays will likely be much lower provided that drivers use designated layover spaces.

# Appendix 5: Station Capacity

The 2012 and 2040 station capacity is evaluated using standard inputs for passenger flows through a variety of station facilities (e.g. faregates, escalators, etc.) and other input data, as summarized in Table A-9. The station capacity analysis plans for the morning and afternoon peak 15-minute period in years 2012 and 2050, as shown in Tables A-10 and A-11.

Table A-12 summarizes the station capacity needs calculated in Tables A-10 and A-11. Circulation elements at the existing mezzanine meet the minimum requirements for 2012 and estimated 2040 passenger loads.

Table A-9: Capacity Analysis Inputs

| | Category | Value | Units | Source |
|---|---|---|---|---|
| A | 15-minute peak hour factors: | | | |
| | AM Exit | 0.260 | | Metrorail Station Access & Capacity Study |
| | AM Entry | 0.348 | | Metrorail Station Access & Capacity Study |
| | PM Exit | 0.260 | | Metrorail Station Access & Capacity Study |
| | PM Entry | 0.364 | | Metrorail Station Access & Capacity Study |
| B | Peaking factor for exits only | 1.28 | | Foggy Bottom-GWU Station Second Entrance Demand Analysis |
| C | Escalator flow rate | 90 | p/min | Transit Capacity and Quality of Service Manual |
| D | Peak analysis period | 15 | min | - |
| E | Faregate flow rate | 35 | p/min | Transit Capacity and Quality of Service Manual |
| F | Farecard vendor usage | 4 | % | Observations |
| G | Farecard vendor flow rate | 1.67 | p/min | Observations |

Table A-10: Summary of 2012 Capacity Analysis

| | | Morning Peak | | | Afternoon Peak | | | |
|---|---|---|---|---|---|---|---|---|
| | Category | Exits | Entries | Total | Exits | Entries | Total | Source |
| H | Passengers, hourly peak | 69 | 645 | 714 | 560 | 110 | 670 | Faregate data |
| I | Passengers, 15-min. peak | 18 | 224 | 242 | 146 | 40 | 186 | H * A |
| Required Facilities | | | | | | | | |
| J | Platform escalators | 1 | 1 | 2 | 1 | 1 | 2 | (B * I) / (C * D) |
| K | Platform elevators* | | | 2 | | | 2 | Metro practice |
| L | Faregate aisles | 1 | 1 | 2 | 1 | 1 | 2 | (B * I) / (D * E) |
| M | Farecard vendors | | 1 | 1 | | 1 | 1 | (F * I) / (D * G) |

** Current practice by Metro is to provide two platform elevators per mezzanine.*

Table A-11: Summary of 2040 Capacity Analysis

| | | Morning Peak | | | Afternoon Peak | | | |
|---|---|---|---|---|---|---|---|---|
| | Category | Exits | Entries | Total | Exits | Entries | Total | Source |
| H | Passengers, hourly peak | 93 | 871 | 964 | 756 | 149 | 905 | Model results |
| I | Passengers, 15-min. peak | 24 | 303 | 327 | 197 | 54 | 251 | H * A |
| Required Facilities | | | | | | | | |
| J | Platform escalators | 1 | 1 | 2 | 1 | 1 | 2 | (B * I) / (C * D) |
| K | Platform elevators* | | | 2 | | | 2 | Metro practice |
| L | Faregate aisles | 1 | 1 | 2 | 1 | 1 | 2 | (B * I) / (D * E) |
| M | Farecard vendors | | 1 | 1 | | 1 | 1 | (F * I) / (D * G) |

** Current practice by Metro is to provide two platform elevators per mezzanine.*

Table A-12: Station Capacity Analysis Results

| Circulation Element | Existing | Elements Required 2012 | Elements Required 2040 |
|---|---|---|---|
| Platform Escalators | 2 | 2 | 2 |
| Platform Elevators* | 1 | 2 | 2 |
| Faregate Aisles | 4 | 2 | 2 |
| Farecard Vendors | 7 | 1 | 1 |

** Current practice by Metro is to provide two platform elevators per mezzanine.*

# Appendix 6: 2040 Shuttle Demand

This study's intended methodology to estimate shuttle trips to 2040 was originally used in Metro's *Shuttle Services at Metro Facilities* study. The analysis comprises the following steps:

1. Observe existing shuttles and record operating characteristics.
2. Define a shuttle market area around Naylor Road Station based on location of existing shuttles as well as existing and planned transportation network.
3. Obtain 2010 and 2040 household and employment estimates from MWCOG Round 8 Cooperative Forecasts.
4. Grow shuttle trips according to market area conditions.

However, Naylor Road Station is presently not served by any shuttles, so it is not feasible to estimate future shuttles by pivoting off of an existing count. To substitute this existing methodology but still retain the same principles, this study compared existing (2010) and future (2040) land use data (employment and households) within traffic analysis zones[3] (TAZ) no farther than 1.5 miles from the station entrance (the range where shuttles are most likely to exist, as observed in the *Shuttle Services at Metro Facilities* study). Table A-13 shows household and employment density near Naylor Road station. The three shaded rows in Table A-13 highlight the TAZs where shuttle trips are more likely to be provided due to proximity to the station and large growth in household or employment density. While not guaranteed, planning for up to three shuttle trips per hour during peak periods—one per high growth TAZ—is a reasonable assumption given the available data.

3. A Traffic Analysis Zone is a special area delineated by state and/or local transportation officials for tabulating traffic-related data. A TAZ usually consists of one or more census blocks, block groups, or census tracts (U.S. Census Bureau)

Table A-13: Household and Employment Density

| | | 2010 | | 2040 | | Difference | | Percent Difference | |
|---|---|---|---|---|---|---|---|---|---|
| TAZ* | Jurisdiction | Household Density | Employment Density | Household Density | Employment Density | Household Density | Employment Density | Household Density | Employment Density |
| 285 | DC | 1,768 | 789 | 2,134 | 1,419 | 366 | 630 | 21% | 80% |
| 286 | DC | 6,675 | 330 | 6,999 | 475 | 323 | 145 | 5% | 44% |
| 301 | DC | 5,087 | 1,235 | 5,989 | 1,310 | 902 | 75 | 18% | 6% |
| 302 | DC | 4,947 | 298 | 5,145 | 307 | 198 | 9 | 4% | 3% |
| 303 | DC | 983 | 820 | 1,028 | 838 | 45 | 18 | 5% | 2% |
| 304 | DC | 3,845 | 1,618 | 5,520 | 3,222 | 1,675 | 1,604 | 44% | 99% |
| 751 | MD | 1,433 | 7,571 | 1,393 | 8,905 | -40 | 1,335 | 3% | 18% |
| 753 | MD | 2,003 | 115 | 1,979 | 115 | -24 | 0 | -1% | 0% |
| 757 | MD | 3,409 | 2,150 | 3,404 | 2,387 | -6 | 236 | 0% | 11% |
| 769 | MD | 2,953 | 2,922 | 2,987 | 3,418 | 34 | 496 | 1% | 17% |
| 770 | MD | 5,061 | 229 | 5,020 | 1,453 | -41 | 1,224 | -1% | 534% |

# Appendix 7: 2040 Kiss & Ride Demand

The Naylor Road Station Kiss & Ride would likely be redesigned as part of a station area redevelopment. To estimate a conservative, maximum number of temporary parking spaces needed for a future Kiss & Ride facility, this study utilized Naylor Road Station's 12 percent Kiss & Ride mode share from the *2007 Metrorail Passenger Survey*. Based on station observations, which showed a parking utilization rate of approximately 17 vehicles per hour, 30 spaces (A-spaces and metered spaces) will be sufficient to accommodate a 12-percent share of 2040 Naylor Road Station passengers. Additional space would be required for curbside pick-up/drop-off, taxi, ADA, car-sharing, and motorcycle.

Table A-14: 2040 Kiss & Ride Parking Needs

| Category | | Value | Source |
|---|---|---|---|
| A | Estimated daily entries at Naylor Road Station in 2040 | 4,017 | Travel demand model |
| B | Existing Kiss & Ride mode share | 12% | 2007 Metrorail Passenger Survey |
| C | Kiss & Ride turnover (vehicles per hour per space) | 17 | Station observations |
| | Kiss & Ride temporary parking spaces (A-spaces and metered spaces) needed in 2040* | 30 | A * B / C |

** Rounded value*

# Appendix 8: Emergency Egress

To meet NFPA 130 evacuation criteria, all passengers (i.e. station occupant load) on the station platform must clear the platform in four minutes and reach a point of safety in six minutes (note that the six-minute period includes the time to clear the platform). The station occupant load consists of the entraining load (i.e. all passengers entering the station to board a train) and the train load (i.e. passengers already on a train) during the peak period.

The entraining load and the train load per platform are the sums of the entraining loads or train loads per track. A surge factor is applied to the entraining and the train loads in both directions, and a factor of two is applied to the peak direction to account for one missed headway, per NFPA 130 requirements. Thus, the station occupant load for Naylor Road Station in 2012 is:

- 2012 AM Peak Station Occupant Load = [2 * surge * (NB entraining load + NB train load] + [surge * (SB entraining load + SB train load)]
  = [2 * 1.3 * (59 + 238)] + [1.3 * (9 + 37)] = 831

- 2012 PM Peak Station Occupant Load = [2 * surge * (SB entraining load + SB train load)] + [surge * (NB entraining load + NB train load)]
  = [2 * 1.3 * (12 + 434)] + [1.3 * (1 + 50)] = 1,225

*Note: Naylor Road Station entraining and train loads for 2012 and 2040 are calculated in Tables A-18, A-20, A-22, and A-24. Values in this example are rounded.*

In the high level planning analysis used for this study, passengers disperse according to the available capacity of the exit points. One escalator is assumed out of service, and the remaining escalator is assumed to be stopped and usable as a stairway.

## Time to Clear Platform

The vertical circulation facilities (e.g. stopped escalator and emergency stairways, not elevator) may be a limiting factor in how quickly a station platform is cleared. Calculating the exiting capacity for Naylor Road Station is relatively simplified because passengers would exit via one of two possible choices, and both lead to the same mezzanine:

1. West stairway and escalator (assumed stopped, but usable as stairway)
2. East stairway (escalator assumed to be completely out of service)

For Naylor Road Station, the west stairway and escalator account for 64 percent of the egress capacity and station occupant load, while the east stairway accounts for the remaining 36 percent. Using this method, along with calculating passenger walk times, it would take approximately 3.6 minutes to clear the platform in the morning peak and 5.2 minutes to clear the platform in the afternoon peak in year 2012. Passengers would clear the platform more slowly in the afternoon peak period because of the higher station occupant load compared to the morning peak.

## Time to Reach a Point of Safety

Calculating the time to reach a point of safety (defined as the street level completely outside of all station structures) employs the same principle. After clearing the platform, the capacity of faregates (assumed to be open in an emergency) and the width of the mezzanine exit may be limiting factors in how quickly the station occupant load reaches a point of safety. In addition to the time spent walking along the exit path, the analysis accounts for the wait time at each potential choke point along the way. The analysis found that wait times at faregates and mezzanine exit would be non-existent, as the person-per-minute throughput capacity at each potential chokepoint increases as the passengers get closer toward the exit. In other words, the platform-to-mezzanine stairways and escalator are the only bottleneck in the station. Passenger queues would form on the platform in an emergency situation because of the limited throughput capacity of the stairways and escalator. These vertical circulation facilities would act as a funnel, allowing only some of the passengers through. The comparatively larger throughput capacity of the faregates and the mezzanine exit ensures that the limited number of passengers that have already descended to the mezzanine can proceed without waiting in additional queues.

Table A-15 details the analysis inputs used to calculate times to clear the station platform and to reach a point of safety.

Table A-16 summarizes the vertical, faregate, and mezzanine exit capacity, as well as the walking time for the longest practical route to reach a point of safety under 2012 and 2040 ridership.

Tables A-17 and A-24 provide a detailed breakdown of the NFPA 130 morning and afternoon peak analyses.

Table A-15: NFPA 130 Analysis Input Data

| Category | Value | Units | Source |
|---|---|---|---|
| Metrorail crush capacity | 220 | Passengers/car | *Metro Manual of Design Criteria for Maintaining and Continued Operation of Facilities* |
| Escalator width | 48 | Inches | *Metro Manual of Design Criteria for Maintaining and Continued Operation of Facilities* |
| Stair width | 60 | Inches | *Metro Manual of Design Criteria for Maintaining and Continued Operation of Facilities* |
| Surge factor | 1.3 | | *Metro Ballston-MU Station Exiting* |
| Walking speed | 124 | Feet/minute | *NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems* |
| Vertical walking speed (down) | 48 | Feet/minute | *NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems* |
| Capacity for stairs and stopped escalators (down) | 1.41 | Persons/inch/minute | *NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems* |
| Capacity for faregates | 50 | Persons/minute | *NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems* |
| Capacity for ADA or emergency faregates | 75 | Persons/minute | *NFPA 130: Standard for Fixed Guideway Transit and Passenger Rail Systems* |

Table A-16: NFPA 130 Preliminary Analysis

| 2012 Ridership | | | | | 2040 Ridership | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Platform-to-Mezzanine Capacity | | | | | | | | | |
| | # | width (in.) | p/in/min | p/min | | # | width (in.) | p/in/min | p/min |
| Stairs | 2 | 60 | 1.41 | 169.2 | Stairs | 2 | 60 | 1.41 | 169.2 |
| Escalators | 1 | 48 | 1.41 | 67.7 | Escalators | 1 | 48 | 1.41 | 67.7 |
| Total | | | | 236.9 | Total | | | | 220.1 |
| Faregate Capacity | | | | | | | | | |
| | # | | p/min | p/min | | # | | p/min | p/min |
| Faregates | 4 | | 50 | 200.0 | Faregates | 4 | | 50 | 200.0 |
| ADA gate | 1 | | 75 | 75.0 | ADA gate | 1 | | 75 | 75.0 |
| Serv. gate | 2 | | 75 | 150.0 | Serv. gate | 2 | | 75 | 150.0 |
| Total | | | | 425.0 | Total | | | | 425.0 |
| Mezzanine Exit Capacity | | | | | | | | | |
| | # | width (in.) | p/in/min | p/min | | # | width (in.) | p/in/min | p/min |
| West Exit | 1 | 131 | 2.08 | 272.5 | West Exit | 1 | 131 | 2.08 | 272.5 |
| East Exit | 1 | 131 | 2.08 | 272.5 | East Exit | 1 | 131 | 2.08 | 272.5 |
| Total | | | | 545.0 | Total | | | | 545.0 |
| Walking Time for Longest Route (Excluding Wait Times) | | | | | | | | | |
| | | ft. | ft./min | minutes | | | ft. | ft./min | minutes |
| Platform | | 255 | 124 | 2.1 | Platform | | 255 | 124 | 2.1 |
| Vertical | | 30 | 48 | 0.6 | Vertical | | 30 | 48 | 0.6 |
| Mezzanine | | 135 | 124 | 1.1 | Mezzanine | | 135 | 124 | 1.1 |
| Total* | | | | 3.8 | Total* | | | | 3.8 |

** Total walking time for longest route rounded up to the nearest tenth*

Table A-17: NFPA 130 Complete Analysis Inputs (2012 Morning Peak)

| Category | | Value | Units |
|---|---|---|---|
| A | AM peak 15-minute factor for station | 0.661 | |
| B | AM arriving half hour train load from Suitland (NB, peak direction) | 1,176 | passengers |
| C | AM arriving half hour train load from Southern Ave (SB, off-peak direction) | 139 | passengers |
| D | AM peak systemwide 15-minute factor | 0.660 | |

*Source: Station Access & Capacity Study*

Table A-18: NFPA 130 Complete Analysis (2012 Morning Peak)*

| Category | | 2012 | Formula or Source |
|---|---|---|---|
| a | Peak Half-Hour Period (entries) | 323 | Metro faregate data (2012) |
| b | Peak 15-Minute Period (entries) | 214 | A * a |
| c | Headway for peak direction (minutes) | 4.6 | Metro |
| d | Headway for off-peak direction (minutes) | 6 | Metro |
| e | Peak Direction (NB) Entraining Load (entries)… | 59 | (c / 15) * b * [B / (B + C)] |
| f | *… with surge and missed headway factors applied* | 152 | 1.3 * 2 * e |
| g | Off-peak Direction (SB) Entraining Load (entries) | 9 | (d / 15) * b * [C / (B + C)] |
| h | *… with surge factor applied* | 12 | 1.3 * g |
| i | Peak Direction (NB) Train Load (passengers per train)… | 238 | (c / 15) * B * D |
| j | *… with surge and missed headway factors applied* | 619 | 1.3 * 2 * i |
| k | Off-peak Direction (SB) Train Load (passengers per train)… | 37 | (d / 15) * C * D |
| l | *… with surge factor applied* | 48 | 1.3 * k |
| m | Total Occupant Load (passengers on platform) | 831 | f + h + j + l |
| Time to Clear Platform (minutes) | | 3.6 | |
| Wait Time at Platform Exit (minutes) | | 1.5 | |
| Walk Time to Platform Exit (minutes) | | 2.1 | |
| Platform Clearance Time (minutes) | | 3.6 | |
| Walking Time Down to Mezzanine Level (minutes) | | 0.6 | |
| Wait Time at Faregates (minutes) | | 0.0 | |
| Walking Time to Faregates (minutes) | | 0.6 | |
| Faregate Clearance Time (minutes) | | 0.6 | |
| Wait Time at Mezzanine Exit (minutes) | | 0.0 | |
| Walking Time to Mezzanine Exit (minutes) | | 0.3 | |
| Mezzanine Exit Clearance Time (minutes) | | 0.0 | |
| Time to Reach Point of Safety (minutes) | | 4.4 | |

** Rounded values*

Table A-19: NFPA 130 Complete Analysis Inputs (2040 Morning Peak)

| Category | | Value | Units |
|---|---|---|---|
| A | AM peak 15-minute factor for station | 0.661 | |
| B | AM arriving half hour train load from Suitland (NB, peak direction) | 1,475 | passengers |
| C | AM arriving half hour train load from Southern Ave (SB, off-peak direction) | 230 | passengers |
| D | AM peak systemwide 15-minute factor | 0.660 | |

*Source: Station Access & Capacity Study*

Table A-20: NFPA 130 Complete Analysis (2040 Morning Peak)*

| Category | | 2040 | Formula or Source |
|---|---|---|---|
| a | Peak Half-Hour Period (entries) | 437 | Model results (2040) |
| b | Peak 15-Minute Period (entries) | 289 | A * a |
| c | Headway for peak direction (minutes) | 2.5 | Metro |
| d | Headway for off-peak direction (minutes) | 2.5 | Metro |
| e | Peak Direction (NB) Entraining Load (entries)… | 42 | (c / 15) * b * [B / (B + C)] |
| f | *… with surge and missed headway factors applied* | 108 | 1.3 * 2 * e |
| g | Off-peak Direction (SB) Entraining Load (entries)… | 6 | (d / 15) * b * [C / (B + C)] |
| h | *… with surge factor applied* | 8 | 1.3 * g |
| i | Peak Direction (NB) Train Load (passengers per train)… | 162 | (c / 15) * B * D |
| j | *… with surge and missed headway factors applied* | 422 | 1.3 * 2 * i |
| k | Off-peak Direction (SB) Train Load (passengers per train)… | 25 | (d / 15) * C * D |
| l | *… with surge factor applied* | 33 | 1.3 * k |
| m | Total Occupant Load (passengers on platform) | 571 | f + h + j + l |
| Time to Clear Platform (minutes) | | 2.5 | |
| Wait Time at Platform Exit (minutes) | | 0.4 | |
| Walk Time to Platform Exit (minutes) | | 2.1 | |
| Platform Clearance Time (minutes) | | 2.5 | |
| Walking Time Down to Mezzanine Level (minutes) | | 0.6 | |
| Wait Time at Faregates (minutes) | | 0.0 | |
| Walking Time to Faregates (minutes) | | 0.6 | |
| Faregate Clearance Time (minutes) | | 0.6 | |
| Wait Time at Mezzanine Exit (minutes) | | 0.0 | |
| Walking Time to Mezzanine Exit (minutes) | | 0.3 | |
| Mezzanine Exit Clearance Time (minutes) | | 0.0 | |
| Time to Reach Point of Safety (minutes) | | 4.4 | |

** Rounded values*

Table A-21: NFPA 130 Complete Analysis Inputs (2012 Afternoon Peak)

| Category | | Value | Units |
|---|---|---|---|
| A | PM peak 15-minute factor for station | 0.684 | |
| B | PM arriving half hour train load from Suitland (NB, off-peak direction) | 183 | passengers |
| C | PM arriving half hour train load from Southern Ave (SB, peak direction) | 2,081 | passengers |
| D | PM peak systemwide 15-minute factor | 0.680 | |

*Source: Station Access & Capacity Study*

Table A-22: NFPA 130 Complete Analysis (2012 Afternoon Peak)*

| Category | | 2012 | Formula or Source |
|---|---|---|---|
| a | Peak Half-Hour Period (entries) | 61 | Metro faregate data (2012) |
| b | Peak 15-Minute Period (entries) | 42 | A * a |
| c | Headway for peak direction (minutes) | 4.6 | Metro |
| d | Headway for off-peak direction (minutes) | 6 | Metro |
| e | Peak Direction (SB) Entraining Load (entries)… | 12 | (c / 15) * b * [C / (B + C)] |
| f | *… with surge and missed headway factors applied* | 31 | 1.3 * 2 * e |
| g | Off-peak Direction (NB) Entraining Load (entries)… | 1 | (d / 15) * b * [B / (B + C)] |
| h | *… with surge factor applied* | 2 | 1.3 * g |
| i | Peak Direction (SB) Train Load (passengers per train)… | 434 | (c / 15) * C * D |
| j | *… with surge and missed headway factors applied* | 1,128 | 1.3 * 2 * i |
| k | Off-peak Direction (NB) Train Load (passengers per train)… | 50 | (d / 15) * B * D |
| l | *… with surge factor applied* | 65 | 1.3 * k |
| m | Total Occupant Load (passengers on platform) | 1,225 | f + h + j + l |
| Time to Clear Platform (minutes) | | 5.2 | |

| | |
|---|---|
| Wait Time at Platform Exit (minutes) | 3.1 |
| Walk Time to Platform Exit (minutes) | 2.1 |
| Platform Clearance Time (minutes) | 5.2 |
| Walking Time Down to Mezzanine Level (minutes) | 0.6 |
| Wait Time at Faregates (minutes) | 0.0 |
| Walking Time to Faregates (minutes) | 0.6 |
| Faregate Clearance Time (minutes) | 0.6 |
| Wait Time at Mezzanine Exit (minutes) | 0.0 |
| Walking Time to Mezzanine Exit (minutes) | 0.3 |
| Mezzanine Exit Clearance Time (minutes) | 0.0 |
| Time to Reach Point of Safety (minutes) | 6.7 |

** Rounded values*

Table A-23: NFPA 130 Complete Analysis Inputs (2040 Afternoon Peak)

| Category | | Value | Units |
|---|---|---|---|
| A | PM peak 15-minute factor for station | 0.684 | |
| B | PM arriving half hour train load from Suitland (NB, off-peak direction) | 287 | passengers |
| C | PM arriving half hour train load from Southern Ave (SB, peak direction) | 2,483 | passengers |
| D | PM peak systemwide 15-minute factor | 0.680 | |

*Source: Station Access & Capacity Study*

Table A-24: NFPA 130 Complete Analysis (2040 Afternoon Peak)*

| Category | | 2040 | Formula or Source |
|---|---|---|---|
| a | Peak Half-Hour Period (entries) | 83 | Model results (2040) |
| b | Peak 15-Minute Period (entries) | 57 | A * a |
| c | Headway for peak direction (minutes) | 2.5 | Metro |
| d | Headway for off-peak direction (minutes) | 2.5 | Metro |
| e | Peak Direction (SB) Entraining Load (entries)… | 9 | (c / 15) * b * [C / (B + C)] |
| f | *… with surge and missed headway factors applied* | 22 | 1.3 * 2 * e |
| g | Off-peak Direction (NB) Entraining Load (entries)… | 1 | (d / 15) * b * [B / (B + C)] |
| h | *… with surge factor applied* | 1 | 1.3 * g |
| i | Peak Direction (SB) Train Load (passengers per train)… | 281 | (c / 15) * C * D |
| j | *… with surge and missed headway factors applied* | 732 | 1.3 * 2 * i |
| k | Off-peak Direction (NB) Train Load (passengers per train)… | 33 | (d / 15) * B * D |
| l | *… with surge factor applied* | 42 | 1.3 * k |
| m | Total Occupant Load (passengers on platform) | 797 | f + h + j + l |
| Time to Clear Platform (minutes) | | 3.4 | |
| Wait Time at Platform Exit (minutes) | | 1.3 | |
| Walk Time to Platform Exit (minutes) | | 2.1 | |
| Platform Clearance Time (minutes) | | 3.4 | |
| Walking Time Down to Mezzanine Level (minutes) | | 0.6 | |
| Wait Time at Faregates (minutes) | | 0.0 | |
| Walking Time to Faregates (minutes) | | 0.6 | |
| Faregate Clearance Time (minutes) | | 0.6 | |
| Wait Time at Mezzanine Exit (minutes) | | 0.0 | |
| Walking Time to Mezzanine Exit (minutes) | | 0.3 | |
| Mezzanine Exit Clearance Time (minutes) | | 0.0 | |
| Time to Reach Point of Safety (minutes) | | 4.9 | |

** Rounded values*

# Appendix 9: Crash Rate Comparison

Crash rates are typically reported as the number of crashes 100 million vehicle miles traveled. Tables A 25 and A-26 calculate the 2008 crash rates for Branch Avenue and Naylor Road, respectively. This study used year 2008 because it was the most recent year where both crash and annual average daily traffic (AADT) data were available for comparison. Branch Avenue's total crash rate per 100 million vehicle miles traveled (VMT) is more than two times Naylor Road's rate.

Table A-25: Branch Avenue Crash Rate (2008)

| Category | | Value | Units | Source |
|---|---|---|---|---|
| A | Total crashes near the station | 35 | Crashes | SHA |
| B | AADT near the station | 57,101 | Vehicles | SHA |
| C | Roadway segment length | 0.4 | Miles | Google Earth |
| | Roadway segment crash rate | 420 | Crashes / 100 million VMT | (A * 10^8) / (B * 365 * C) |

Table A-26: Naylor Road Crash Rate (2008)

| Category | | Value | Units | Source |
|---|---|---|---|---|
| A | Total crashes near the station | 6 | Crashes | SHA |
| B | AADT near the station | 20,420 | Vehicles | SHA |
| C | Roadway segment length | 0.4 | Miles | Google Earth |
| | Roadway segment crash rate | 201 | Crashes / 100 million VMT | (A * 10^8) / (B * 365 * C) |

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